FS01.OC.01

Abundance partition and life-history evolution of tropical stream fishes in a microhabitat scale

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The evolution of life histories has been a central theme of ecological studies. The relationship between reproductive traits of organisms and its contemporary environmental characteristics has brought fruitful insights about the how the environment control the success of organisms and its spatial distribution. In the last decades, ichthyologists used this approach in broad spatial scales aiming to disentangle the effect of habitat variability and predictability on the patterns of diversification of fish life histories. Although very useful to predict the effect of large scale environmental changes (*e.g.* global warming) on the functional constitution of fish assemblages, these spatial scales do not allow to understand the patterns in a local niche scale, where the organisms interact. Using an observational approach of tropical stream fish assemblages, we show that the fish partition, in a small spatial scale, its abundance between habitats and that this partitioning is close related to its life history strategies. Species with an opportunistic strategy (with small investment in individual offspring) were highly associated to temporary pond habitats and equilibrium-species (with high investment in individual offspring) were mostly associated to the mainstream channel. We discuss the behavioral attributes whose allow the species to leading with different habitat variability; the importance of spatial resolution on the perception of the patterns; and pointed out some perspectives for the study of life history in tropical streams.

FS01.OC.02

Distribution, richness and population densities of subterranean fishes from Bodoquena Plateau caves, Mato Grosso do Sul, Brazil (Teleostei: Siluriformes)

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The Bodoquena Plateau is a typical karst landscape with a remarkable rich and vulnerable subterranean fauna. Such type of land is an irregular limestone area in which erosion of the soluble rocks by acidulated waters has produced many karst features as fissures, sinkholes, underground streams and cave systems. Due to the complex groundwater drainages, many troglobitic (exclusively subterranean) species inhabit the aquatic subterranean systems, where fishes are conspicuous elements and the main predators of the aquifer. We present the current knowledge on richness and distribution of the subterranean ichthyofauna, as well as population data for three species. Four troglobitic species of catfishes (Siluriformes) have been so far recognized: *Ancistrus formoso* (Loricariidae), *Trichomycterus dali* (Trichomycteridae), and two undescribed species, *Ancistrus* sp. n. and *Rhamdia* sp. n. (Heptapteridae). There is probably a fifth species, which will be referred here as *Trichomycterus* cf. *dali*. Three among these species are endemic of a single cave system: *Ancistrus fomoso*, recorded only in the Formoso/Formosinho Spring (Formoso river basin), and *Ancistrus* sp. n. and *Rhamdia* sp. n., which are sympatric in the Fadas Cave system (Salobra River basin). The *Trichomycterus* species are widely distributed throughout the limestone plateau and are currently known from 10 localities, comprising two regional river basins (Prata and Salobra basins). The population densities of *Ancistrus* sp. n. and *Rhamdia* sp. n. have been monitored since 2008, presenting low oscillation along the time. Ancistrus sp. n. presents very low densities (0,002 individuals /m²), whereas the *Rhamdia* sp. n. shows higher densities (around 0,2 individuals/m²). The population densities of *Trichomycterus* cf. *dali* from Urubu Rei Cave differed considerably along two years of monitoring (0,6 – 0,01 individuals/m²) and showed a tendency to decline, possibly as a consequence of water population and/or of the impacts of irregular touristic activities in this cave.

FS01.OC.03

Distribution and occupancy of non-native species in the upper Paraná river floodplain

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The introduction of species is one of major threat to fish assemblage's diversity, due to generate consequences for all native fish fauna. When a species reach a new environment, it begins a very complex process of occupation, dependent on the propagule pressure, biological demands of the invasive species and interactions with the existent fish assemblage. In Brazil, especially in the upper Paraná river, stocking programs, live bait fishing, sportive fishing and aquarium are the main causes of introductions for using non-native species. Furthermore, this region is affected by dams which changes the characteristics of the river, mainly the water transparency. Therefore, this study aimed to identify the spacial distribution of some non-native cichlids species under effect of water quality on the upper Paraná river floodplain (Subsystems: Baía, Ivinhema and Paraná). It was observed that the ichthyofauna of all region is strongly influenced by non-native species. Among the biotopes, the isolated lagoons at Baía and Ivinhema subsystems presented the highest abundance of non-native species, mainly *C. kelberi*, probably due to its voracity and parental care, intensified by isolation time on these biotopes during dry period. Initially, it was expected that sites with greater mean transparency – of the Paraná subsystem - present more introduced species. However, Baía subsystem was more influenced by non-native species, despite the less transparency. Thus, the characteristics of cichlids, as well as the local dynamic of the flood and wide distribution of these non-native species suggests that there is not a point of stability to the abundance of non-native species increase, so that some of them are already established, whereas others are in early stages of invasion.

FS01.OC.04

Lateral migration of fish between an oxbow lake and an Amazonian headwater river

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We report on lateral movements of fish between an Amazonian headwater river (Manu River in Manu National Park, Peru) and a 24-ha oxbow lake (Cocha Cashu) in the adjacent floodplain. During wet season flood pulses, or "crecientes" fish can enter and exit the lake through a connecting channel that is normal dry. To investigate fish movements, we operated a bi-directional funnel trap in the connecting channel during high water interludes. We captured 4090 fish of 60 species during the 2005 and 2006 rainy seasons and sub-sampled the adults for gonadal state and stomach contents. We found that most exiting fish were gravid and that most entering fish had recently spawned, suggesting that fish were leaving the lake to spawn in the river or elsewhere. Entering fish had full stomachs more often than exiting fish and entering and exiting individuals of most species were of similar size.

FS01.OC.05

Fishers' local ecological knowledge identify ecological functional groups of freshwater fishes in a large Brazilian Amazon River

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Reproductive strategies and habitat use of tropical freshwater fishes are usually poorly known, but important information to support fisheries management and environmental impact assessments. We aim to analyze fishers' local ecological knowledge (LEK) about abundance trends, habitats and reproduction of 14 fish species in the Lower Tocantins River, Brazilian Amazon, downstream from a large dam. We interviewed 137 fishers from eight fishing villages: according to the majority of them (chi-square tests), 10 of the 14 studied fish species had their abundances reduced, two were either mentioned as being increased or decreased in abundance and two increased in abundance. We identified 10 habitats of occurrence and 14 spawning habitats for the 14 fish species (considering only data cited by more than 5 % of interviewees), including both macro (main river, lakes) and micro-habitats (submerged wood, deep pools). We made two Principal Component Analyses based on interview data of fish habitats and of fish spawning habitats: first principal components (PC) of these two ordinations explained 55.7 % and 61.5 % of variation in the data, respectively. The ordination based on habitat distinguished fishes that occur in: a) lotic and deep habitats (river pools), b) lakes and tributary rivers and c) submerged wood and beaches. The ordination based on spawning habitats distinguished fishes that spawn in deep sites in the main river from those fishes that spawn in tributary rivers, lakes and submerged vegetation. The first PCs of these two ordinations were not correlated to the number of fishers who mentioned a decrease in abundance of the 14 fish species, indicating that threats to these fishes were not related to habitat or spawning sites. Fishers' LEK evidenced ecological functional groups of freshwater fishes regarding habitat use and reproduction, which is useful information in management needed and data poor Brazilian Amazonian rivers.

FS01.OC.06

Freshwater priority setting of the Amazon Basin

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Maintaining the ecological integrity of the Amazon Biome has become a critical issue for global climate regulation. At the core of any conservation strategy is the need to establish and effectively manage core protected area. Nowadays, around 29% of the Amazon is designated as a protected area. However, most of these areas have been created using a terrestrial priority setting framework.
In the absence of reliable and wide-coverage information of freshwater biodiversity features and patterns we decided to use surrogates by selecting enduring hydro geomorphic characteristics (hydrology, altitude, vegetation and biogeography) as proposed by Thieme et al. (2007). The Ecological Risk Index (ERI) (Mattson and Angermeier 2007) was selected as a proxy of the conservation status of freshwater ecosystems because it integrates the effects of different stressors (pollution, ecological flow alteration, etc.) on their main biotic drivers. By combining the frequency of several impacts with estimates of their potential effect on any biotic driver (flow regime, physical habitat, water quality, energy sources, and biotic interactions), the ERI provide us with a synthetic measure of the impact of human activities on freshwater ecosystems. We used Marxan to identify the potential conservation priorities by combining the resulting heterogeneity model and the ERI as a “cost” layer. The connectivity analysis conducted with Zonation allow for the identification of rivers to be preserved due to the high environmental value to connectivity and biodiversity protection they represent. Beyond that, all the spatial data and analytical tools are the core of a decision support system that allows for the analysis of regional and cumulative impacts over all hydrological system and corresponding aquatic ecosystems of the Amazon basin.

FS01.P.01

ECOMORPHOLOGICAL PATTERNS OF THE FISH ASSEMBLAGE IN TIDAL ROCKPOOLS AT AMAZON COASTAL ZONE

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We aimed to identify the presence of ecomorphological patterns that responded to ecological patterns of species founded in tidal rockpools at Brazilian Amazon Coastal Zone (ACZ). The selected rockpools are distributed in Pará State, Brazil. The fishes were collected in two expeditions (at rainy and dry season) in 2011. Seventeen morphometric measures were taken of ten specimens of each one of the 14 species, when possible, using digital caliper with precision of 0.1 mm. Fins areas were obtained utilizing individual digitalized outlines. Twelve ecomorphological attributes related to locomotion and position aspects were submitted to a Principal Components Analysis (PCA) to identify the ecomorphological attributes that better responded for the morphological variation among species, utilizing the Broken-stick model as stopping rule. PCA pointed the formation of three axes with 75.54% of explanation. Aspect ratio of pectoral fin influenced strongly the first axis, grouping species with migratory behavior with higher values (*Amphiarius phrygiatus*, *Atherinella* aff. *brasiliensis* e *Mugil* sp.), whereas those species were occasional or rare species on rockpools at ACZ according abundance and frequency of capture. Resident species showed higher stabilization capacity in rocky substratum and less capacity of performing regression and progression movements, including a dominant species (*Bathygobius soporator*) and a frequent species (*Butis koilomatodon*). The only resident species among the seven collected that didn't followed this pattern was *Omobranchus punctatus*, indicating that this is an important factor of the assemblage organization. Eye position and depression index grouped benthonic species of dorsal eyes and with high stabilization capacity due the depressed body, as *Batrachoides surinamensis* and *O. punctatus.* The presences of abundant species with low stabilization capacity and/or with lateral eyes suggest the existence of other important ecomorphological or behavioral patterns as aspect ratio of the other fins for the ecomorphological organization of tidepools fishes at ACZ.

FS01.P.02

Growth pattern of the Four-eyed fish *Anableps microlepis* Müller &Troschel, 1844 (Cyprinodontiformes: Anablepidae) in the Amazon Coastal Zone, Brazil

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In order to evaluate the growth pattern of the four-eyed fish *Anableps microlepis* (Cyprinodontiformes: Anablepidae) through the weight-length relationship. The samples were collected in Amazon Coastal Zone (ACZ), and it was sampled individuals in July 2010 to June 2011 in the daytime low tide. After capture, individuals were sexed, measured as standard length (Ls, cm) and total weight (Wt, g). Weight-length relationship estimated by $Wt=a*Ls^b$, where a = intercept at *x* to *y* and b = slope. We sampled 382 specimens of *A. microlepis*, being 183 females and 199 males. Population structure on the Ls showed an average of 13.6 ± 3.6 cm for females and 12.0 ± 1.6 cm for males. The weight was observed an average change of 36.7 ± 24.2 g and 22.2 ± 7.7 g for females and males, respectively. We noticed a difference in growth patterns between sexes (Mann-Whitney test, p = 0.001), and the weight-length relationship for females was described by $Wt = 0.011\ Ls^{3.012}$, a = 0.008, b = 3.116, indicates a pattern of positive allometric growth. For males was obtained the equation $Wt = 0.037Ls^{2.508}$,a = 0.055, b = 2.351, indicating a pattern of negative allometric growth. It was found that both females (R^2 = 0965, p = 0, 437) and males (R^2 = 0838, p =0.752) did not exhibit polyphasic growth. This cannot be considered a pattern growth for the species of the genus *Anableps*, considering that for males of *A. anableps* the ACZ has been verified polyphasic growth. Data obtained in this study may support the description of the development related to the life stages of four-eyed fish and to expand knowledge about ecological indicators of these species.

FS01.P.03

Towards a non-lethal fish sampling technique in neotropical streams: comparing electrofishing, clove oil, and rotenone.

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Rotenone sampling is currently the only efficient technique to assess fish assemblage structure and species abundance in Guianese freshwater streams. This technique is however highly destructive and our aim was to search for a non-lethal alternative.
Two techniques were tested: electrofishing that temporarily immobilizes fish; and clove oil which has an anaesthetic effect. In each site, we separated a stream section by stop-nets. We then conducted a two-pass electrofishing or released clove oil according to the site. All the fish captured from each section were stored before releasing Rotenone over the entire sampling area to collect the remaining fish. This procedure was repeated in 19 and 9 sites for electrofishing and clove oil, respectively. This permitted to test for environmental effects such as water conductivity, water depth or stream width.
Comparing electrofishing and clove oil catches to total removals (i.e. the tested non-lethal method + rotenone), reveals that the efficiency of the two methods was slightly influenced by stream conductivity, but significantly decreases with stream size. Indeed, in the smaller streams (c.a. 2 meters wide and 0.1 meter deep) 88% and 92% of the fish were caught by electri~~c~~cfishing and clove oil, respectively. In contrast, in bigger streams (c.a. 5 meters wide and 0.5 meter deep), only 15 to 20% of the fish were caught using the non-lethal techniques.
We conclude that the two non-lethal technics might only be an efficient alternative to the rotenone in the smaller streams.

FS01.P.04

Morphological responses of a tropical fish to river damming

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It is widely know that dams alter the fish assemblage structure, but effects of river damming on tropical native species persisting in reservoirs are largely unexplored. In this study, we examined whether impoundment affects the body shape of *Astyanax bimaculatus*, a widely distributed characin fish in the South America. We collected individuals from three pairs of reservoir and river habitats across the Paraíba do Sul River (Brazil). These impoundments vary in relation to the degree of connection between habitats: 1) without connection; 2) with temporary fishway; 3) and with permanent connection. We hypothesized that differences between habitats (e.g. flow regime) would result in morphological divergence in fishes that inhabit them. Geometric morphometric methods were used to obtain shape variables and multivariate analyses were performed to analyze body shape differences. The Discriminant Function Analysis classified 70.3% (Mahalanobis distance = 1.06; P = 0.0009) of individuals into the correct habitat, confirming the intraspecific divergence. We conducted a Multivariate Analysis of Covariance to examined effects on body morphology attributable to centroid size (covariate), habitat, location (i.e. comparison among reservoir–river pairs), and the interaction between habitat and location. Habitat and location explained 23.2% and 35.7% of partial variance in shape, respectively. Furthermore, interaction was not observed (P = 0.130). Individuals inhabiting rivers are streamlined, have a shorter dorsal and anal fin base, a relative upturned mouth and a more anteroventrally pectoral fin than individuals in reservoirs. We also found that the dam with permanent connection had a less morphological diversification. Therefore, the connection between habitats is an important factor driving shape diversification. The observed morphological patterns are consistent with functional morphological principles suggesting adaptive divergence. Thus the environmental impacts of dams should also be evaluated within the morphological divergence context in order to take the appropriated measures for management and conservation purposes.

FS01.P.05

PHYTOSOCIOLOGICAL SURVEY ISLAND BALL SEVEN TELES PIRES IN THE RIVER CITY ALTA FLORESTA- MT

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Floristic surveys are of extreme importance for the preliminary knowledge on vegetation formations, because they supply basic and essential information for the execution of more detailed studies on such communities. The present study's objective was to run a phytosociologic survey in an island of the Teles Pires River (09°38'22.05" S and 56°01'35.23" W). The floristic composition and the horizontal structure of the shrub and arboreal strata were determined. The survey was accomplished in 0.2 ha (8 plots of 25 m x 10 m), including all individuals with circumference at breast hight (C.B.H.) greater than 15 cm. For each species the density, frequency, dominance and the index of value of importance were calculated. 130 individuals were sampled and belong to 9 families, 17 genera and 18 species. The families Fabaceae, Myrtaceae and Moraceae presented the greatest number of species. The most frequent species were Tachigali venusta, Zygia juruana, Elizabeta sp, Inga caynnensis and Coccoloba sp. The species Ficus sp, in spite of being represented by only a single individual in the sampled area, presented the larger C.B.H. and consequently larger dominance value. The species that stood out in relation to the values of importance in this environment were: Inga caynnensis, Tachigali venusta and Elizabetha sp. The area structure expressed the characteristics of frequent floods, where species with more efficient strategies become abundant and characterizes the community. The results obtained in this work reinforce the needs for islands conservation in the Teles Pires River system, and are of extreme importance to subsidize managements and biodiversity conservation planning.

FS01.P.06

Impacts of shrimp farms in mangrove areas of Brazil

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About half of the world's original mangrove forests area has been lost in the last decades. Brazil is the country with the second largest area of mangroves with about 13,000 km^2. Brazilian mangroves represent areas of permanent protection. However, there is an increasing use of these areas for aquaculture, industry and urbanization. Aiming to highlight the importance of mangroves conservation, we reviewed impacts of shrimp farms on environmental services provided by these systems. Mangroves provide food, maintain the fishery productivity of adjacent coastal waters by exportation of organic nutrients, represent areas of reproduction and feeding for many marine, freshwater and terrestrial species, preserve regional biodiversity, and promote effluent treatment and shoreline protection. In addition to vegetation suppression, the construction of ponds and barriers for shrimp cultivation prevents the free flow of tides and favors erosion process, increasing sedimentation rates. Regular tidal flushing creates optimal physico-chemical conditions for decomposition which is impaired in such areas. The higher sedimentation buries respiratory roots, increasing tree mortality. The discharge of ponds' effluent increases the input of nutrients causing water eutrophication and food chains decline. To maintain environmental services provided by mangroves, it is necessary to keep its primary production which requires the adequate input of nutrients, decomposition and sedimentation rates. The new project for Brazilian environmental legislation does not recognize apicum formation as part of mangroves. It also permits suppression of mangroves' vegetation where "its ecological functioning is impaired", instead of its recovery. Further, mangrove areas occupied prior to July 2008 will allow livestock, agricultural, and silvicultural activities. Shrimp farming is the main livestock segment in the northeast region of Brazil. If the Brazilian Congress approves this new law project, new areas of mangroves will be suppressed, also affecting the neighboring remaining areas.

FS01.P.07

AGE STRUCTURE AND GROWTH OF Mimagoniates microlepis (STEINDACHNER, 1877) (CHARACIDAE, GLANDULOCAUDINAE) FROM AN ATLANTIC RAINFOREST STREAM, PARANÁ, BRAZIL

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Atlantic Rainforest has a long history of natural resource exploitation. Nowadays with the critical reduction of its area, vulnerability of its remaining fragments and increasing extinction rates, it is urgent the need for conservation and self-sustainable exploitation measures. This study aims to analyze growth and age structure of *M. microlepis* in a coastal stream of Brazil, and contributes with relevant information for conservation of Atlantic Forest fish. Samplings were conducted at Ribeirão River, located at the eastern region of the state of Paraná, between January and December/2002. Three sample sites were chosen at higher, medium and lower portions of the river. Otholits of 585 individuals were analyzed. Data were bimonthly grouped and the number of rings was determined considering the formation of opaque rings. Growth curve in length was obtained by the Von Bertalanffy expression. The formation of rings occurred between July/August and September/October, which corresponds to the reproductive season and also to the ending of the dry season and beginning of the rainy season. The growth curve obtained was $L_t = 7.65\ [1 - e^{0.284661(t+7.4255)}]$ and it is possible to notice that growth slowed down with age. The age structure analysis on three sites of the river showed that young specimens had more proportional participation at station 3. At station 2 intermediate individuals were more representative and at station 1, older fishes were more incident, revealing a pattern where the fish population of *M. microlepis* goes up river during their life cycle.

FS01.P.08

EFFECT OF ENVIRONMENT ON THE COMPOSITION OF THE PARASITIC FAUNA OF HOPLOSTERNUM LITTORALE (HANCOCK, 1828) (SILURIFORMES: CALLICHTHYIDAE) COLLECTED IN TWO LOCALITIES OF PEIXE RIVER, MIDDLE TIETÊ RIVER, SAO PAULO STATE, BRAZIL

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The composition of parasitic fauna of fish in the rivers depends on various factors such as habitat occupied in the river, season, water features, bottom type, depth, fauna present near the habitat occupied by fishes, and biological physiological characteristics of fishes. The aim of this study was to evaluate the effect of environment on the parasitic fauna of *Hoplosternum littorale*, species considered non-migratory or migratory of short distances and which have parental care. Between July and August 2010, 15 fish were collected at the mouth of Peixe river (point 1), at Barra Bonita reservoir, which is influenced by polluting of the Tiete river, and 15 in one marginal pond (point 2) that have permanent connection to the main river channel, called Lagoa da Usina. The point 1 presented lower values of dissolved oxygen, pH, temperature, and dissolved nutrients. The prevalence of metazoan parasites infecting fish in point 1 and 2 was 80% and 93.3%, respectively. At point 1, eight parasite *taxa* were identified while in point 2 only 6 were found. A significant difference in abundance and diversity of parasitic fauna were observed between points 1 and 2. The parasites of point 1 were: Capillariidae gen. sp., *Austrodiplotomum compactum*, *Henneguya guanduensis*, plerocercoid unidentified, crustacean unidentified, *Magnivitellinum corvitellinum*, *Gyrodactylus* sp., Dactylogyridae gen. sp.. At point 2 the parasites identified were: Capillariidae gen. sp., *Austrodiplotomum compactum*, *Henneguya guanduensis*, *Gyrodactylus* sp., *Gyrodactylus* sp. 2, and Glossiphonidae gen. sp. All four parasite *taxa* that were present in both sites had higher abundance in point 1, suggesting an effect of pollutants on parasitic fauna of *H. litoralle* and indicating that the parasite may be used as indicators of environmental impact.

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FS01.P.09

DISTRIBUTION AND RICHNESS OF THE ICHTHYOFAUNA IN SUB BASIN OF THE IPIXUNA RIVER, MID MADEIRA, WESTERN AMAZON, BRAZIL

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This study was carried out at Ipixuna sub basin with the intuitive understanding to investigate the existence and distribution of fish fauna in six (6) "streams" located on the right bank of the Madeira river in the ‘”Ipixuna” Indigenous Territory – in the Amazonas state, Brazil. The fish were caught during the rainfall and dry season during the months of May and September 2006, respectively. Batteries were used standardized gill nets with mesh sizes ranging between 15 mm and 150 mm between adjacent nodes, left for 24 hours, and revised every six hours. Presents the listing of fishes collected in Ipixuna Indigenous Territory streams. They were collected 271 units distributed in 3 orders, 16 families, 30 sorts and 38 species (Table 1). Characiformes with twenty and two species represents about 57 % of the captures. Characidae family with five 13 % species is the most representative, followed by Serrasalmidae with four 10 % and Hemiodontidae with three 8 %. The other families present inferior values. Percifomes and Siluriformes are distinguished the Cichlidae and Auchenipteridae families with nine and three species, respectively. The Ipixuna river sub-basin presents ichthyo composition inside of the standards waited for Amazon with its fauna represented by three of the four main orders (Characiformes, Perciformes and Siluriformes (Roberts 1972; Lowe McConnel 1987; Reis et al. 2003).

FS02.P.01

Divergence and the evolution of reproductive isolation within the Hawaiian endemic tree, *Metrosideros polymorpha*

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The highly variable tree, *Metrosideros polymorpha*, and its lesser known relatives, dominate Hawaii's native forests and comprise a wide range of endemic forms with divergent but overlapping morphologies and geographic ranges. As a whole, *Metrosideros* extends across nearly the full spectrum of Hawaii's terrestrial environments, from deserts and windward ridges to wet forests and bogs, spanning elevations of 0 m to 2470 m and annual rainfall of 400 mm to 10,000 mm. We are studying how Hawaii's island structure and striking environmental gradients have contributed to the evolution of these forms. Beginning with *M. polymorpha* on Hawaii Island, our study of neutral genetic structure among 23 populations revealed distance-dependent gene flow, clustering of populations by variety, and strong differentiation of varieties associated with extreme habitats. The extreme differentiation of the Hawaii Island-endemic, riparian *var. newellii* from other sympatric varieties indicates unexpectedly rapid local adaptation (within 500,000 years) within a long-lived, continuously distributed, and highly dispersible tree species. Further, *var. newellii* populations grouped with a glabrous bog form of *M. polymorpha* from the island's oldest volcano (Kohala), indicating a likely pathway for the evolutionary origin of *var. newellii*. In addition, our hand-pollination studies of two common forms on Hawaii Island, early-successional *var. incana* and late-successional *var. glaberrima*, revealed partial, late-acting reproductive barriers consistent with a genetic mechanism that is usually attributed to reproductive isolation between species. Lastly, our greenhouse experiments of these same two varieties revealed greater growth and survivorship of *var. incana* seedlings in high-light treatments and greater survivorship of *var. glaberrima* seedlings in low-light treatments, suggesting that successional gradients can drive evolutionary divergence and reproductive isolation within long-lived tree species. Combined, these results indicate significant roles for both habitat diversity (strong divergent selection) and genetic drift in the evolutionary diversification of extremely widespread, long-lived, and highly dispersible woody species.

FS02.P.02

Life-history variation in long-lived cycad species from contrasting tropical forests

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Cycad species can exhibit a wide range of ecological diversity, ranging from small species with subterranean stems to large species with tall stems, and from xerophytic plants in open habitats to species in the understory of tropical rainforests. Diversity in life-history strategies in plants can result from high investment in reproduction or in survival, and from trade-offs between reproduction-growth-survival, among others. Field studies with several *Zamia* species evidence a wide variation in life-history traits like frequency of reproduction, fecundity allocation, and early-stages survival. For example, populations of *Zamia obliqua* in the dark understory of the Choco rainforests reproduce sparsely and several years can pass between coning events in a locality, while populations of *Zamia encephalartoides* in open dry areas of the Chicamocha canyon in Colombia produce massive cones and many seeds every year; and germination rates and survival of seedlings can differ drastically between these two species growing in contrasting habitats. In the other hand, monitoring data on growth and reproduction in botanical collections can be useful to document life-history trade-offs. For example, individuals of *Zamia elegantissima* show decreased leaf production after coning, which could represent a cost of reproduction. Long-term data from studies in natural populations and collections can be used to explore variation in life-history traits in cycad populations and to evaluate the impact of this variation on population dynamics and viability, therefore providing important information for conservation programs.

FS02.P.03

Neotropical habitat transitions and evolution of morphological traits: A case study with *Anemopaegma* Mart. ex. Meisn. (Bignonieae, Bignoniaceae)

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The “tropical conservatism hypothesis” suggests that the high diversity of species found in the Neotropics is a consequence of longer times for speciation within individual biomes and a tendency for species to retain their niches over evolutionary time. However, there is increasing evidence that biotic interchange among biomes has also contributed for increased diversity in the Neotropics. *Anemopaegma* Mart. ex Meisn. is a large and morphologically diverse clade of shrubs and lianas that is broadly distributed in the New World. The genus includes 45 species that occupy humid forests and dry areas from Mexico to southern Brazil and Argentina. Most *Anemopaegma* species are restricted to one habitat or vegetation type and the distributions of several species closely match the patchy distribution of nutrient-poor soils in the Amazon. In this study, we used a molecular phylogeny to study the biogeographic history of *Anemopaegma* as well as the evolution of several morphological traits. In particular, we examined whether the evolution of shrubby habit is associated with the occupation of dry habitats and whether such transitions are linked to shifts in diversification rate.

FS02.P.04

Efficacy of *Paullinea* sp. (SAPINDACEAE), in the alternative control of gastrointestinal nematodes, Minas Gerais state, Brazil

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As a result of intense economic exploitation of the Cerrado, part of the native vegetation is in danger of extinction. Plant species are widely used for their medicinal and nutritional value. However, few studies have evaluated the effect of these anthelmintic species *Paullinea* sp. Is a species of shrub and vine of the Sapindaceae family. This specie, in the study area was naturally selected by sheep grazing. Thus, the aim of the work is to evaluate the activity of anthelmintic *Paullinea* sp. on gastrointestinal nematodes of sheep. The leaves of *Paullinea* sp. were collected in the municipality of Montes Claros/MG/Brazil, oven dried at 40°C, shredded and grounded into a powder. Carrying out the test of inhibition of larval development through the technique of fecal culture with three treatments, followed by seven repetitions: (i) ivermectin (16 mg mL-1), (ii) control (distilled H2O) and (iii) powder of dry *Paullinea* sp. leaves. The fecal culture were homogenized with two ml of distilled H2O, two grams of vermiculite and two grams of dried plant powder, which was covered with plastic wrap and incubated in an environmental chamber at 28°C for seven days. The larvae were collected in a test tube, counted and identified. The result is expressed as: Efficiency = 100% - (LDPG treated * 100 / LDPG control). In this study**,** *Paullinea* sp. differed from the treatment with distilled water and showed anthelmintic activity of 70.12% similar to ivermectin treatment. In the control group, were identified the larvae of *Haemonchus* sp. The anthelmintic activity of the Sapindaceae family and the specie *Paullinea* sp., may be associated with saponin and tannin respectively. Phytotherapy is a promising alternative for the control of helminthiasis, promoting the reduction of chemical residues in animal products and in the environment, and promote a sustainable grazing for animals in the Cerrado.

Keywords: Cerrado, phytotherapy, anthelmintic.

FS02.P.05

CANOPY FOREST COMMUNITY STRUCTURE IN SEMIDECIDUOUS MONTANE FOREST DOMINATED BY *Eremanthus erythropappus* (DC.) MacLeish (Asteraceae)

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ABSTRACT

We investigate a monodominant population of Eremanthus erythropappus (Asteraceae) after intense death of individuals in a secondary succession ecosystem, after 60 years from abandoning of a tea plantation, in the Itacolomi State Park, part of the MAB site Reserve of Espinhaço. All plants above 15cm of breast height circumference were identified and measured in 10 plots of 20x20m, where we. We grouped species in similar ecological groups (pioneers, early secondary and late secondary) and separated accordingly to their diameter and height. We measured seedling recruitment and light available at ground level in 50 nested plots of 2x2m. We found 936 individuals of 53 species and 24 families. Floristic and community parameters related to live plants, such as diversity and equitability were similar of found in other montane forests. Initial secondary species are the more important and among the largest trees in the community. The diameter and height distributions of the 10 most abundant species showed distinct patterns, which are apparently associated with life histories of each specie and to the effects of fragmentation and disturbance. The live individuals of E. erythropappus were less than 50% of total individuals and basal area. On the other hand, dead individuals summed up 419 (44.7%), and 413 was identified as E. erythropappus and had 12.2 m²/ha basal area and 64.6% of dominance. The recruits were 22 in all plots and negatively correlated with shadow. The results found indicate that dead E. erythropappus individuals are among the oldest trees in the community and may facilitate the establishment of other species. The great mortality found can be due to senescence and self-thinning and, thus, the fragment is not dominated by E. erythropappus anymore. We can conclude that study forest is in intermediate stage of succession, with diversification of species that are present in the canopy.

Key words: Senescent, candeal, secondary forest, dead, montane.

Acknowledgment: Fapemig

FS02.P.06

Neutral mean of deterministic samples: different individuals in similar species

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Species with similar niche coexist in highly diverse tropical communities, contradicting the classic niche theory. The coexistence of ecologically equivalent species may occur if stochastic processes drive community assembly. This theoretical conflict between the classic niche-based theory and the neutral theories has intensified in the last decade, and evidences of stochastic processes driving community assembly have strengthened. Here, we test how the ecological scale, rather individuals or species, can fit the pattern of ecological equivalence proposed by the neutral theory. We used three generalist species of anurans (*Leptodactylus chaquensis, L. podicipinus* and *L. elenae*) that coexist in the highly diverse Pantanal wetland, and adopted diet as the main niche dimension. We used the *V* index, which measures the interindividual niche variation, to test ecological equivalence among individuals. To test equivalence among species, we used the Pianka´s index of niche overlap. We found evidence of individual niche specialization for all species (V=0.66-0.76, $p<0.01$). This result suggests the action of deterministic forces (like competition) on the segregation of individual niche within each species. On the other hand, the mean niche overlap among species was greater than expected by chance (0.236, p=0.03), suggesting ecological equivalence among species and, consequently, the action of stochasticity on community assembly. Thus, deterministic forces seem to act on individual scale, determining the ecological variations within species. However, species niche is the sum or average of all individual niche breadths, and this assumption collapses the interindividual variation and makes the species ecologically similar. Thus, the narrowing of individual niches within each species may decrease the niche overlap among individuals of different species. In this way, interindividual niche variation might decrease the pressures of interspecific competition, allowing the coexistence of ecologically similar species in highly diverse communities.

FS02.P.07

Small scale genetic structure in *Euterpe edulis* Mart. (Arecaceae), a rainforest palm tree

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Environmental changes may influence population and community dynamics. *Euterpe edulis* is an endangered tropical palm, once abundant throughout the Atlantic Forest from the coastal plain up to 1000 meters above sea level. The main purpose of this study was to evaluate the genetic diversity and structure in natural populations of *E. edulis* distributed along an elevational gradient. The study was conducted in a protected area of Serra do Mar, at the north coast of São Paulo State, where we sampled 300 adults from six locations. Each individual was genotyped with seven microsatellite loci. The total allele richness was high (140) and the mean allele richness did not vary between samples. The total expected heterozygosity was 0.867, ranging from 0.782 to 0.859 among samples. The inbreeding coefficient was low in all samples, in accordance with the outcrossing breeding system. The genetic structure was high ($\theta' = 0.26$) considering that the maximum distance between samples was 32 km; and the assignment test revealed four likely groups, each well visualized in the graphical representation. A partial Mantel test correlated the pairwise genetic structure with the geographical distance ($r = 0.8$; $p < 0.05$) and also with the pairwise altitudinal differences without the effect of the geographic distances ($r = 0.5$; $p < 0.05$). Whether those differences are mainly due to reduced gene flow or to local adaptation remains to be tested in future studies. This pattern of genetic differentiation at short distances is unexpected within a continuous rainforest, highlighting the importance of small scale approaches to understanding the complex dynamics of tropical systems.

FS02.P.08

USING PROCRUSTES-BASED GEOMETRIC MORPHOMETRICS TO DETECT DISPERSION PATTERNS IN *Erythrodiplax fusca* Rambur 1842 (Odonata: Libellulidae)

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Population structure inferences can be used to indirectly infer dispersion patterns of organisms. Such studies are usually based on molecular markers, which are costly and often difficult to standardize. One available alternative is Procrustes-based geometric morphometric analysis. In this work, this technique was used to infer the populational structure of *Erythrodiplax fusca* based on differences in wing shape. We sampled 25 individuals from each of four distinct localities in Minas Gerais State bordering the Brigadeiro Mountain Range, two of them (1 and 2) on the east side and the other two (3 and 4) on the west side. This range presents an approximate North-to-South configuration, with altitude gradually decreasing in this direction. Canonical variable analysis results suggest that the wing shape of the NE sample (sample 1, from Bom Jesus do Madeira, the highest point of elevation in the sample) is significantly different from the remaining samples. However, the SE (sample 2, from Muriaé) and SW (sample 4, from Rio Pomba) samples did not differ significantly, nor did the NW (sample 3, Viçosa) and SW samples. Despite the SE and NW samples being geographically closer than those from the SE and SW, the SE and NW samples differed significantly from each other. Our results suggest that the mountain range acts as an important barrier to the dispersion of *E. fusca*, and that this barrier is more important to restricting the dispersion of this species than the geographic distance between the samples. Our analyses also suggest that the SW sample acts as a connector between the SE and NW samples, following the stepping stone model. This work shows the value of Procrustes-based geometric morphometrics to detect population structure in *E. fusca*, which in turn suggests that high altitude barriers limit the dispersion of this species.

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FS02.P.09

Seasonal flooding structuring small mammal communities in the Amazonia-Cerrado Ecotone

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At the Cerrado-Amazonia ecotone there are gallery forests that never flood located in the upper areas of the watercourse margins and seasonally flooded gallery forests located in lower grounds. The influence of this small-scale habitat heterogeneity induced by seasonal floods on the structure of small non-volant mammal assemblages was investigated. Small mammals were captured in an ecotonal region of the Cantão State Park, central Brazil, using pitfalls with plastic drift fences and live traps set in unflooded gallery forests and in gallery forests that suffer seasonal floods. Species composition differed between the two forests, mostly due to a marked dominance of arboreal species in seasonally flooded forests. In unflooded forests there was a more equitable distribution of terrestrial and arboreal species. Unflooded forests had higher species richness than seasonally flooded forests, while relative biomass of seasonally flooded forests was more than twice that of unflooded forests due to the dominance of large-bodied didelphid species. A close assessment of the species absent from seasonally flooded forests, the species-poorer habitat, suggests that the difference in the number of species between the two forest types is mostly due to the decrease in available area for strictly terrestrial small non-volant mammals in seasonally flooded forests. In fact, the influence of seasonal floods seems to persist all year-round by affecting forest structure and floristic diversity, and acting as a primary environmental filter. The mosaic of habitats constituted by upland and alluvial gallery forests promotes rich mammal assemblages. The preservation of that mosaic from deforestation, agricultural conversion, and implementation of dams is essential to guarantee the maintenance of a large number of species with different habitat requirements.

FS02.P.10

Diet of the frog Diaglena spatulata in different succesional stages of a tropical dry forest

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The importance of secondary forests as facilitators of passive landscape restoration and recovery of faunal communities in landscapes fragmented by farming activities is increasingly recognized. To evaluate the role of secondary forests as providers of food resources for anurans, we studied the diversity and composition of the diet of the frog *Diaglena spatulata* in different succesional stages of tropical dry forest of Chamela, Jalisco, México. Stomach contents of 187 individual from four succesional stages (SS) and old forest (OF) were obtained by stomach flushing. Importance of prey types was evaluated by the Index of Relative Importance. *D. spatulata* consumed a wide variety of invertebrates (16 orders, or prey types). In the four SS the most import prey types were grasshoppers, spiders and beetles. In OF beetles were not found in the stomach samples. Three groups of prey (butterfly larvae, spiders and grasshoppers) were found in all SS, and in OF. Frogs of early SS (pastures and plots of 5-6 years of successional age) consumed fewer types of prey (6), than late SS (8-10, and plots of 15-17 years of successional age) (11 prey types in each). We found 4 prey types in frogs from OF. Scorpions were found only in frogs from early SS. Ants and termites were found only in frogs from late SS. The OF showed the lowest diversity in diet, followed by early SS. The highest diet diversity was found in the late SS. Analysis of diet similarity in prey composition and abundance arranged SS and OF in three groups (early SS, late SS and OF) suggesting a close relationship between diet and the stage of forest development.

FS02.P.11

Community of amphibians and reptiles in the Private Reserve of Natural Heritage Cabeceira do Prata, Mato Grosso do Sul, Brazil.

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The Bodoquena Plateau, is an ecotone between the savanna and seasonal forest formations of the Atlantic Forest, home of high diversity of amphibians and reptiles with endemic species. Its biological value is priceless and is recognized as a priority area for biodiversity conservation. This study was aimed to evaluate the composition and estimate the richness, abundance and species diversity of amphibians and reptiles in the Private Reserve of Natural Heritage (RPPN) Cabeceira do Prata, Jardim, Mato Grosso do Sul. Monthly expeditions of five consecutive days were realized from July of 2010 to December of 2011, using pitfall traps. There were six sets of traps in a "Y" format, and each set with four containers of 100 liters, with a distance of 10m each. The phytophysionomies sampled were: riparian forest, seasonal forest and arboreal savanna. We recorded 18 species of anurans amphibians (n=529) where *Physalaemus albonotatus* and *Leptodactylus cf. diptyx* were dominant at 29% and 13% of relative abundance, respectively. Were also recorded 13 species of reptiles (n=46), wich were 5 snakes (Colubridae) and 7 lizards (Tropiduridae, Teiidae, Gymnophthalmidae, Scincidae and Amphisbaenidae). *Stenocercus caducus* was the most abundant reptile, prevalent in seasonal forest. Four species were found in all sampled environments, *Leptodactylus cf. diptyx, Leptodactylus chaquensis, Physalaemus albonotatus* and *Stenocercus caducus*. The environment that had the highest species richness was the Arboreal Savana, sheltering 39% of the species found. It is suggest that the environmental complexity of phytophysionomies is the main factor that determines the local distribution of species, and thus maintaining the diversity of the local herpetofaunal is linked to conservation of forest fragments in the region with different phytophysionomies.

FS02.P.12

The geological influence on vascular epiphytes communities.

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Even though there that at regional scales plant distributions are determined by habitat factors at local scales, however, habitat factors and species distributions show comparable spatial aggregation and little is known about the influence on the geological substrate on plant communities. We sampled vascular epiphytes in six sites along 40km of Iguaçu's riverside forests with similar tree communities. We tried to address how vascular epiphyte sinusia varied among different geologies. The study was located at the transitions from the first to the second plateau of Paraná, Brazil on three different substrates: granulite, an ancient metamorphic rock with at about 1.8 b.y., sandstone, a sedimentary rock with at about 400 m.y. and siltstone a sedimentary rock with at about 280 m.y. With 50m in wide the river has, on the granulite, flood plains with more than 2 km of extension, on the sandstone, small or no flood plains and, on the siltstone, flood plains varying from 100 to 700m. The 180 trees were divider on tree strata were all vascular epiphytes had its biomass estimated according to tree categories: small, medium and big, further converted to notes 1, 5 and 10. The notes for each epiphyte species on each host tree were then summed. We used MDS with trees as samples and geology as factor and MRPP as *posteriori* test. Although we could not get 100% segregation with some samples mixed on the NMDS, a huge proportion of the forophytes did split as expected and the communities were not equal (A=0,15; p<0,0000001). The observation of species typical of *restinga* vegetation on the sandstone habitat suggests that this is a dryer environment and that water availability caused by difference on geomorphology and soil (both consequence of geology) could be the main explanation for these observations.

FS02.P.14

Demographic history of *B. pauloensis* reveals stable area in southeast of Brazil

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Bombus pauloensis is distributed in a large area in south and southeastern Brazil. This species is an important pollinator of native flora and also shows potential as pollinator for economic crops. The goal of this research was to understand the demographic history of *B. pauloensis* by using past distribution predictions, molecular and biogeography data.

The distribution predictions were obtained by Ecological Niche Modeling (ENM). The haplotype network was performed based on 1557 bp of 4 concatenated mitochondrial regions (COI, CytB, 16S, and $tRNA^{Lys}/tRNA^{Asn}$) of 100 specimens. The phylogeny of the 6 Brazilian species of Bumble bees was reconstructed based on 1109 bp of 3 mitochondrial DNA regions (COI, 16S and $tRNA^{Lys}/tRNA^{Asn}$) calibrated with molecular clock. The statistical Dispersal-Vicariance Analysis (S-DiVA) was conducted using RASP.

According to ENM, *Bombus paoloensis* suffered a geographic restriction during the Last inter-glacial (~120,000 – 140,000 years BP) in the south and southeast of Brazil followed by an expansion in the Last-glacial maximum (~21,000 years BP). Molecular data showed higher haplotype diversity in southern and lower genetic diversity in the north and northeastern Brazil, a typical scenario of species expansion. Biogeography data suggested that the clade of Brazilian *Bombus* species, which includes *B. pauloensis*, probably had its origin in Parana Forest or Atlantic Forest provinces at 2Mya at least, and subsequently dispersed towards Savannah and Amazonia regions. The data from past distribution predictions, molecular analysis and biogeography were congruent, revealing the southeast of Brazil as the central region of origin and diversification of *B. pauloensis*. Furthermore, according to future simulations using ENM in 2080, the actual *B. pauloensis* distribution area will be reduced mainly to southeast of Brazil, indicating it as a stable area that should be preserved to conserve the genetic diversity of this bee.

FS02.P.15

The demography of *Araucaria angustifolia* in a grassland landscape

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Araucaria angustifolia is a dioecious conifer, which is listed as a critically endangered species. There is very little research on the araucaria's distribution within grassland landscapes. Therefore, in this study, the spatial distribution patterns and basic ecological processes of an *Araucaria angustifolia* population were investigated through a spatially explicit census. This study aims to answer the following: (i) are there are processes involved in the mortality of early stages of development that are dependent on the distance of adults, and; (ii) whether the araucaria's regeneration is light dependent in their initial developmental stages, which, if so, juveniles will occur in more open areas than seedlings. A permanent 9 ha plot (300x300 m, subdivided in 10x10 m subplots) was established within a grassland landscape. All individuals (from seedlings to adults) were mapped, measured and identified. Canopy cover was estimated using a spherical densitometer. Second-order uni and bivarirate spatial pattern analysis was utilized. As result there were 864 seedlings, 1669 juveniles, 144 non-mature and 146 reproductive trees. Within the 9 ha plot, 84% was considered grassland (subplots with cover <50%), and 16% was considered patchy woodland (cover >50%). All ontogenetic stages showed aggregation in the entire spatial pattern analysis extent, however, seedlings were the most aggregated. It was found that (i) seedlings and female individuals were spatially dependent; while spatial dependence between juveniles and females was less intense. (ii) Canopy cover did not significantly differ between seedlings and juveniles (<1.5m of height). According to the spatial pattern of the seedlings a limited dispersal capability is suggested. Processes dependent on the distance of females are involved in the mortality of early developmental stages, however, there is no light dependence (individuals with height <1.5m). The latter suggests that other factors have more influence than light on the spatial dynamics of initial stages.

FS02.P.16

Karyotype diversification in legumes of Dalbergieae tribe from several Brazilian plant formations

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The tribe Dalbergieae *sensu* Klitgaard & Lavin (2005) has undergone recent changes in its circumscription. In Brazil, about 28 genera are distributed in a wide geographical range and plant formations. *Dalbergia* and *Machaerium* have high value wood and were included in the list of endangered species by their intensive exploitation. We aimed to investigate whether chromosome evolution in species of Dalbergieae followed similar pathways in different plant formations. We investigated the chromosome number, distribution of CMA/DAPI bands (rich in AT or CG bases, respectively) and specific DNA sequences by the technique of DNA *in situ* hybridization (FISH) using the sequences of 5S and 45S rDNA. So far, we have determined the chromosome numbers of 19 species, of *Aeschynomene*, *Dalbergia*, *Geoffroea*, *Machaerium*, *Stylosanthes* and *Zornia* collected in the Cerrado, Caatinga, Atlantic Forest, Restinga and Chaco in Brazil. Most species had 2n=20, confirming x=10 as the basic chromosome number for the tribe. Polyploidy occurred in *Machaerium opacum* (Cerrado) and *Stylosanthes hamata* (Chaco), reinforcing the importance of this change in chromosome evolution of plants. The characterization of CMA/DAPI banding and FISH (especially for 5S rDNA) showed heterogeneity in the tribe, with variations in the number and location of markers on chromosomes, indicating structural changes, with transpositions and differential amplification of satellite DNA families. Although our sample is very small and more studies are needed, the generalized heterogeneity of CMA/DAPI banding and FISH in all plant formations and the restriction of polyploidy to the Cerrado and Chaco allow us to infer some different evolutionary pathways in different plant formations.

FS02.P.17

Richness of endophyte fungi along a rain forest altitudinal gradient

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Endophytic fungi are widely diverse and found asymptomatically in every vegetal species. Although inconspicuous, they are important components to the vegetal community maintenance. The diversity of these fungi vary according to climate change. Altitudinal gradients provide an interesting scenario where environmental conditions change abruptly at short distances. Generally at high altitudes, the temperature and the humidity are lower while the wind velocity is higher, restricting the composition of fungi species. The aim of this study was to evaluate the endophyte diversity in leaves fully expanded of *Baccharis dracunculifolia* (Asteracea) found in two altitudinal gradients (30 to 50m; 240 to 260) in an ombrophilous dense forest in Ilha Grande (23°11's, 44°19'W), Angra dos Reis, RJ (Brazil) during the dry season (April and July). Three leaves were selected from each individual (n=15) for endophyte evaluation. The leaves collected were superficially sterilized and then cut into smaller fragments (2x2mm²) and insert into PDA (Potato-Dextroses-Agar) for growth. After growth, fungi were isolated in Petri dishes of PDA and separated into morphospecies according to macroscopic traits (color, form, opacity, brightness). We found 57 endophyte fungi morphospecies during the first sample season, and 40 in the second one. The higher endophyte richness was observed in the second sample period at the lower altitude. In this same altitude during the dry season we recorded the largest species number during the first sample event. The larger community similarity between altitude occurred in the first sample event (IJ23%). These results are similar to another field study that shows endophyte decrease with altitude in a dry season. We thank FAPEMIG and CNPq for financial support.

FS02.P.18

DIFFERENCIAL SURVIVAL AND RECRUITMENT OF NATIVE AND ENDEMIC SPECIES IN RESTORED RUPESTRIAN FIELDS: A LONG-TERM STUDY

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The rupestrian field is a species-rich ecosystem with one of the highest level of endemism in the tropics. Currently, they have been drastically threatened by anthropogenic activities, such as intensification of fire occurrences and road opening. Studies to improve the restoration of rupestrian fields are therefore urgently needed. Within this framework, ten native shrub species were transplanted into a degraded area in Serra do Cipó 8.5 years ago and their survival and recruitment were monitored in 2012. Four species had high survival rates (*Heteropterys byrsonimifolia*: 87,5%, *Dasyphyllum reticulatum*: 73,4%, *Tibouchina heteromalla*: 70%, and *Jacaranda caroba*: 68,75%) while two species recorded a survival below 10 % (*Mimosa foliolosa* and *Marcetia taxifolia*). Four other species (*Collaea cipoensis, Diplusodon hirsutus, Diplusodon orbiculari and Chamaecrista semaphora*) presented survival rates between 10 and 40 %. Otherwise, survival itself should be combined with seedling recruitment to provide better indication on species success in restoration programs in this harsh environment. *Chamaecrista semaphora* was the species with the highest seedling recruitment: its seedlings were found in 87% of the plots. Despite the low survival rates shown for *Mimosa foliolosa,* its seedlings were found in 60% of the study plots. For the first time this study shows that is possible to transplant native species into the harsh rupestrian fields to restore degraded areas. Acknowledgments to Fapemig and CNPq.

FS02.P.19

Nesting of *Podocnemis expansa* (Testudines: Podocnemididae) in the middle Solimões river, Amazonas, Brazil

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Podocnemis expansa has been submitted to an overexploitation of its natural populations, being considered a species which depends on protection programs for its conservation. This study analyzed aspects of the reproductive biology of *P. expansa* in the middle Solimões river and compared to available data of other populations in Brazil (Trombetas, Araguaia, Purus and Branco rivers). I monitored two *P. expansa* nesting grounds from 2009 to 2011. After nesting, females were marked, measured and weighed and their nests monitored throughout the incubation period. After hatchling emergence, I opened the nests to collect data on clutch size and hatching success. In this region, *P. expansa* nests at the end of receding water (September) and dry (October and November) periods with a nesting peak in October (66.2%). Females of *P. expansa* nesting in the middle Solimões presented an average straight carapace length of 69.3 ± 3.5 cm (N=36), being bigger than females of Araguaia and Trombetas and smaller than those of Purus. Solimões females weighed 32.6 ± 4.1 kg (N=27) and are heavier than those of Trombetas and Araguaia. Females in middle Solimões river laid 102.86 ± 30.8 eggs per nest (N=22), which presented an average hatching success (% of live hatchlings) of 77.5 ± 29.7% (N=21). Clutch size of Solimões females is only bigger than that of Araguaia females and the hatching success is bigger than that of Trombetas river. The average incubation duration (time between nesting and hatchling emergence) was of 57.4 ± 5.4 days. Female size and weigh did not influence the total number of eggs in the clutch or the percentage of live hatchings (N=14, $p>0.05$). This is the first study on *P. expansa* in the middle Solimões region, as this population has been heavily exploited in the past centuries, to the point of being considered ecologically extinct.

FS02.P.20

HIGH INTRAESPECIFIC VARIABILITYIN PECCARIES, Pecar itajacu (ARTIODACTYLA: TAYASSUIDAE) FROM NORTHERNMOST AMAZONIA AND ITS IMPORTANCE FOR CONSERVATION

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Brazil is considered a mega-diverse country harboring about 13% of the entire mammalian fauna of the world. Even today new species are discovered, and it is expected that in the coming decades an increase in the identifications will be obtained. In contrast, very little is known about the mammalian fauna of Roraima, northernmost Brazilian Amazonia. Until recently it was known only two species of wild peccaries occurring in the Amazonia and throughout the Neotropics, the collared peccary (*Pecari tajacu*), and white-lipped peccary (*Tayassu pecari*). However, in 2006 Van Roosmalen described a possible new species in Central Amazonia, the giant peccary, *Pecari maximus*, despite his findings being questioned by the scientific community. The aim in this study was to show the high intraspecific variability detected in specimens of peccaries (*Pecari tajacu*) collected from subsistence hunters in Novo Paraíso settlement, Roraima, northernmost Amazonia. Standard and new morphological measures were taken from both the skulls and jaws, and the results analyzed statistically through agglomerative hierarchical analysis, which were corroborated by subsequent molecular analysis of tissue samples (Mitochondrial D-loop control region sequence analysis). We present a high intraspecific variation in the morphological traits of *P. tajacu* from this region, with at least three clusters with peculiar not only morphological characteristics, but also behavioral, and highlight the importance of their protection in this highly impacted region in order to avoid the loss of genetic variability.

FS02.P.21

Climatic fluctuations as motor for speciation processes in flightless Saltatoria (Insecta: Orthoptera): study on the flightless grasshopper genus Parepistaurus

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Abstract

East Africa is known for its high degree of endemism, especially in the old basaltic rock mountains like the Eastern Arcs. Many genera of Saltatoria have radiated in montane areas, especially from the families with flightless members like Lentulidae, Eumastacidae, Acrididae and Tettigoniidae. In every current isolated montane area different species are present. Their narrow ecological demands do not allow dispersion under the present climatic conditions. Modes and times of spread and speciation are exemplarily shown for the flightless grasshopper genus *Parepistaurus*. Distribution patterns make reconstruction of the former climate (and thus the vegetation cover) possible of when spreading of common ancestors occurred and also of when corridors through which these ancestors originated are made apparent.

Addressed questions

We address several questions that might explain the biogeographical patterns observed in *Parepistaurus*:

1. Are the old coastal forests of Tanzania and Kenya the source of species for inland taxa in *Parepistaurus*?
2. Did river systems serve as corridors for the spread of *Parepistaurus* into the hinterland?
3. Which implications for migration history can be deduced from the ecology of *Parepistaurus* species?
4. Are speciation events boosted by climatic fluctuations rather than caused by a long lasting and stable climate?

Methods

Mechanisms of speciation in mountainous and coastal East Africa are inferred considering (a) phylogenies estimated with a combination of molecular markers (16S rRNA locus, COI and Histone 3), (b) ecological data and (c) the geographic distribution of *Parepistaurus* species.

Results

The study suggests that the coastal taxa of *Parepistaurus* were the source of the high diversity of species found in the Eastern Arc mountains of Tanzania and Kenya. Network analyses and a molecular clock approach, calibrated with the geological age of the volcanoes showed that speciation was boosted by climatic fluctuations affecting large areas of East Africa. With aridification beginning 2.8 Ma b.p., forest taxa were isolated in East Africa due to forest fragmentation and population separation by extended grasslands. However, a humid period between 2.7-2.5 Ma triggered a spread of coastal taxa along the Eastern Arc mountains. Forests expanded again and riparian vegetation along rivers draining into the Indian Ocean served as corridors for the spread of coastal taxa to the hinterland. The inland volcanoes such as Mount Kilimanjaro hereby are good time markers since their geological age is known, limiting the available time for speciation processes of *Parepistaurus* in the area to a maximum of about 1-2 million years. A third humid but cold period between 1.1 and 0.9 Ma probably boosted further the spread of several flightless and montane adapted Orthoptera taxa.

FS02.P.22

LEAF GROWHT DINAMIC OF TWO WOODY SPECIES IN THE BRAZILIAN CERRADO

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Curatella americana L. and *Vochysia divergens* Pohl. are tree species that co-exist in Cerrado areas, the transition to the Pantanal. *C. americana* is a native of Cerrado and into areas subject to flood pulse in the Pantanal, while *V. divergens*, forming monodominant communities in Pantanal area, and advances to Cerrado where the drought is a feature well marked. Whereas the leaves have an essential role in plant physiology, this study aimed to evaluate the leaf emergence dynamics, the leaf life span average, sprouting, and growth rates of leaves of these two species growing in a Cerrado area located on the edge of the Pantanal, 18 km from Cuiabá, MT. Five trees of each species had 20 branches marked, being monitored weekly the sprouting, growth and leaf abscission of branches in the period from June 2010 to July 2011. *C. americana* leaf dynamic displayed an semi-deciduous and *V. divergens* evergreen with seasonal growth. Both species showed a leaf emergence occurring sharply in the dry season. The leaf life span and the sprouting interval was different between species. *C. americana* leaves live an average of 199.8 days with its sprouting interval occurring every 13 days in the dry season and every 53 during wet season, while the *V. divergens* leaves live an average of 244.6 days, and have their sprouting intervals defined in 19 and 39 days in the dry and wet season respectively. The complete expansion of *C. americana* leaves occurs in less than two months, while for *V. divergens* this time exceed 3.5 months. The species of this study showed seasonal phenological patterns with intense vegetative activity in the dry season, indicating high plasticity associaded with other environmental and physiological factors allow for expansion of their populations.

FS02.P.23

From Brazil to the world: how *Eichhornia crassipes* conquered the planet

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The water hyacinth *Eichhornia crassipes* (Mart.) Solms is one of the 100 world's worst invaders. Native to tropical freshwaters of tropical South America, with a putative origin in the Amazon basin and the Pantanal, the water hyacinth is nowadays distributed worldwide. In tropical regions**,** *E. crassipes* escaped into local environments and spread out into the freshwaters proliferating aggressively mainly by means of vegetative reproduction. Due to its ability to double its biomass within only 12 days, it rapidly covers whole water bodies and heavily affects the ecology of local plants and whole ecosystems.

We investigated the genetic structure of the water hyacinth in its native range using AFLPs and cpRFLPs. Genetic distance trees and PCOs based on AFLP data show two separated populations of this species with a western population separated from the main South American population. This differentiation is supported by different chloroplast haplotypes.

The origins in different regions of Southern America of the individuals found worldwide could be demonstrated by integrating worldwide samples into the data set. Several independent anthropogenic introductions into the tropics worldwide could be detected. Samples from botanical gardens of Europe cluster within worldwide samples suggesting a distribution pathway via Europe.

Given the environmental and economical dangers related to the expansion of *E. crassipes*, the role of botanical gardens as initiators of invasions and of other anthropogenic migration factors, such as missionaries and colonists in the past as well as tourists, nurseries, private and commercial trade must be taken seriously. The expansion of this highly aggressive species with high growth rates and no local enemies may further increase due to more favourable growth conditions in formerly non-suited habitats as a consequence of climatic changes.

FS02.P.24

ECOLOGICAL ASPECTS OF LANGSDORFFIA HYPOGAEA MART. (BALANOPHORACEAE) IN A TROPICAL WET FOREST

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Langsdorffia hypogaea is a subterraneous root parasite of Balanophoraceae family. This is a dioecious species that generally occurs in the interior of forest formations and individuals are apparent only during the reproductive period, when the inflorescences emerge from the ground. Very little information is currently known about this species, especially because of the long period that individuals remain underground, making their visualization virtually impossible. To study some ecological aspects of *L. hypogaeae*, a 500m^2 plot was installed in a tropical wet forest area of Estação Ecológica Mata do Cedro, located in Carmópolis de Minas, MG, southwestern Brazil. This study was conducted during January 2012, when *L. hypogaea* was flowering. All the individuals found inside the plot were registered. Litter was hand-removed from the soil until the plant rhizome was located. After location, individuals of *L. hypogaea* found were sexed, measured and the number of inflorescences was determined. For each individual plant, we measured the distance to the nearest neighbor and these were classified into females, males or non- identified (individuals with closed inflorescences). A total of 52 individuals were found at the studied area, and, of these, 65.3% were female and the other 34.7% were male. Female individuals exhibited a significantly greater number of inflorescences than males (X_{fem}=6.97$\pm$1.04, X_{mal}=4.00$\pm$0.79; U=416.500, p=0.031). Besides this, females exhibited greater length (X_{fem}=18.19$\pm$1.61) than males (X_{mal}=15.42$\pm$1.59), but this difference wasn't statistically significant (p>0.05). A spearman correlation revealed no significant relationship between plant length and number of inflorescences (p=0.655). Regarding neighboring, 67.4% of female individuals presented female individuals as nearest neighbors. On the other hand, 66.6% of male individuals presented female individuals as nearest neighbors. This study emphasized some basic aspects of the ecology of this parasitic plant and other studies are being conducted to better understand its significance in tropical ecosystems.

FS02.P.25

List of useful species of Cerrado in family farm in four cities in the State of Goiás, Brazil

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Cerrado biome has great diversity of plant species, including trees, shrubs, herbaceous, and lianas, highlighting among the species, different types of use by agricultural populations, such as food, medicinal, timber and handmade. The aim of this work was to study the species used by family farmers, relation to diversity and forms of use in four municipalities in the State of Goiás, Abadiânia, Corumbá de Goiás, Pirenópolis and Terezópolis de Goiás. Data were collected through semi-structured interviews using snowball sampling technique, as well as by visual observations. In addition, the characterization of the use of species was calculated Shannon-Wiener diversity, Jaccard similarity, and Sorensen indices. Eighty family farms were sampled, twenty from each municipality. Among the interviewees, 66.25 % are female and 33.75 % male, ranging in age from 20 to 69 years, where 72.5 % exploits species of Cerrado for their own consumption, food and medicinal, and 27.5 % sells crafts. Was registered the presence of 19 useful plant species, distributed in 11 botanical families. Fabaceae was the family with greater richness, eight species (42.10 %), and the most species cited were *Hymenaea stigonocarpa Mart. ex Hayne, Caryocar brasiliense Cambess and Mauritia flexuosa L. f.*, being the fruit is the main source of exploitation. The Shannon-Wiener diversity index (H') found for the four cities was 2.30. Abadiânia City presented the smallest index, with H'= 1.08. The Jaccard similarity (J) and the Sorensen similarity (S) between Pirenópolis and Abadiânia were 0.17 and 0.30, minors, respectively.

FS02.P.26

Morphological variation of banded Malayan coral snake (Calliophis intestinalis, Laurenti 1768) in Indonesia

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Calliophis intestinalis is one of the group Elapids snakes spread in Southeast Asia. In Indonesia, this species has distribution in Sumatra, Java and Kalimantan. Differences of the geographical conditions make the morphological variation for this snake population. On variation of *Calliophis intestinalis* in Indonesia has been determined, but the different morphology characters among populations are still poorly known. The research was conducted in Museum Zoologicum Bogoriense by observing 24 banded coral snake specimens from several areas in Indonesia. This research was conducted in April - June, 2009. Morphometric data were taken using image J version 1.2, while scalation and body pattern data were collected using standard method submitted by Peters (1964). Significant differences among populations were found for snout-vent length, tail length, eye-nostril distance, eye diameter, number of ventral and number of subcaudal scales. Vertebral stripe pattern is differ among Sumatera, Java, and Borneo populations. The differences of body pattern are also showed in number of black-ventral bands in each population. Geographical conditions show role in exhibiting patterns of morphological characters. Variation in body patterns, body length, and number of scales are mostly influenced by environment conditions as mechanism of adaptation to survive.

Keywords: *Calliophis intestinalis*, Indonesia, morphological characters, geographical conditions

FS02.P.27

Phylogeny of *Pteronymia* (Lepidoptera: Nymphalidae: Ithomiini) based on morphological characters

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The tribe Ithomiini is a species-rich group of danaine nymphalid butterflies confined to the Neotropical region. With about 370 species in 50 genera, ithomiines are all believed to be unpalatable and are renowned for their part in a number of mimicry rings involving other Lepidoptera. Higher-level phylogenies of the Ithomiini have been proposed based on both morphological and molecular characters, and many of the subtribes and genera are now considered well resolved. In addition, recent species-level phylogenies for several genera based on molecular characters have provided new insights into ithomiine evolution. However, the phylogenetics of one of the most diverse genera, *Pteronymia* Butler & Druce, in the subtribe Dircenniina, have not yet been studied. A phylogeny of the genus *Pteronymia* based on morphological characters is therefore here proposed. We scored characters for 46 of the 47 species in the genus, including all 42 described species and 4 undescribed species. In total, 113 characters were found, based on male and female genitalia, wing venation, androconial scales and immature morphology. An interesting feature was the presence of a sphragis in some species, the first record for Ithomiini. The characters were polarized using three outgroup taxa, and analyzed using maximum parsimony. The analyses resulted in 12 most parsimonious trees, with a length of 675 steps. In the strict consensus, the species appeared distributed in six main groups. One of these groups, *P. inania* + *P. lonera* + *P. teresita*, was formerly treated under the generic name *Talamancana*. The basal branching pattern remained unresolved, so this clade may still be sister to remaining *Pteronymia*. In combination with new data, especially molecular sequence data, this dataset will enable further analyses of this genus and contribute to resolving the relationships among species, helping us to better understand patterns of diversification in this highly diverse clade.

FS02.P.28

The genus *Lippia* (Verbenaceae) in the neotropical region: patterns of geographical distribution and conservation

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The genus *Lippia* consists of approximately 106 species, distributed predominantly in the neotropical region, from the southern U.S. to Argentina, with 5-6% of the species registered in Africa. The highest species richness is concentrated in Brazil, which records 85 species distributed in the *cerrados* and *campos rupestres* with higher species richness in the states of Goiás and Bahia, especially in the Espinhaço Range in Minas Gerais, where 41 species occur. Most of these species are endemic, restricted to one or two places, like *Lippia duartei* Moldenke, a species with occurrence records only for the cerrado of Várzea da Palma city (Minas Gerais), where is found outside protected areas and in serious danger of extinction, with populations represented by few individuals in farm exploration areas. This work is part of the study of the genus *Lippia* for Flora Neotropica and, starting by the analysis of herbarium collections in USA, Europe, South America, with emphasis on the Brazilian collections, provides information on the distribution of species in the neotropics, with maps and reviews about endangered species and strategies for their conservation.
(FAPEMIG, CNPq, Myndel Botanical Foundation)

FS02.P.29

Urticaceae diversity and conservation in the State of São Paulo, Brazil

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The State of Sao Paulo comprises about 250.000 km^2 of southeastern Brazil. The two main types of vegetation State, tropical rain forest (Mata Atlântica) and Cerrado, were included in the list of biodiversity hotspots by IUCN. Urticaceae is a monophyletic group, ranging from herbaceous to woody, with presence of cystoliths, bark or latex restricted or very small, translucent latex, often mucilaginous, pseudomonomerous gynoecium with basal and orthotropic ovule, curved or straight stamens and achene fruit. The family has a cosmopolitan distribution, including about 49 genera and approximately 2000 species, distributed in tropical and subtropical, rarely in temperate regions. The study of Urticaceae in the State of Sao Paulo was based on analysis of 1938 herbarium materials from Brazil and abroad, observation and sampling of populations in nature. In Sao Paulo, Urticaceae is represented by 11 genera and 28 species. *Cecropia pachystachya* Trécul has the widest distribution in the State. *Boehmeria ulmifolia* Wedd., *Myriocarpa stipitata* Benth., *Phenax angustifolius* (Kunth) Wedd., *Pilea hilariana* Wedd. and *P. hyalina* Fenzl were the species that presented a more restricted distribution. Given this situation, we suggest the inclusion of these taxa in the next endangered species lists for the State of Sao Paulo, of which *B. ulmifolia*, *M. stipitata*, *P. angustifolius* and *P. hyalina* are classified in the NT category - near threatened, and *P. hilariana* in the vulnerable B2ab(iii) category (VU), according to IUCN criteria (2010). All Urticaceae species occur in the Atlantic Forest, although only *Boehmeria cylindrica* (L.) Sw., *C. pachystachya*, *Pilea microphylla* (L.) Liebm. and *Urera baccifera* (L.) Gaudich. ex Wedd. occur in Cerrado.

FS02.P.30

Population structure and geographical distribution of the genus *Cecropia* (Urticaceae) in Sub-Amazon region of Brazil.

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The genus *Cecropia* (Urticaceae) is widely distributed in the Neotropics, including several types of vegetation in Brazil. It is a pioneer species with significant ecossystemic importance. The population organization and maintenance of diversity can be discussed from the analysis of the structure of their populations. This study aimed to determine the geographical distribution of plants of the genus *Cecropia* and to describe their horizontal and vertical population structure. The study was carried out in the Brazilian states of Santa Catarina, Paraná, São Paulo, Minas Gerais, Goiás, Mato Grosso do Sul, and Tocantins. For the floristic survey, we used roads and trails as transects, obtaining the presence and absence of individuals to infer their geographical distribution. We sampled 20 individuals at two points in each state, for a total of 280 individuals, and recording the height and circumference at breast height. There were three species of *Cecropia* in different vegetation formations. *Cecropia pachystachya* was the most prevalent, occurring in the states Paraná, São Paulo, Minas Gerais, Mato Grosso do Sul and Goiás, in secondary and more open habitats. *Cecropia saxatilis* was recorded only in the state of Tocantins in primary habitats but in naturally open areas. *Cecropia glaziouvi* was collected in the states of Santa Catarina and Paraná, mostly in environments typical of dense rain forest. We also registered individuals *Cecropia glaziouvi* in a semideciduous forest area of Paraná. There were no records in central and western Santa Catarina and the center-south of Paraná. In the distribution of classes in circumference and height populations was found very close to the standard negative exponential, or inverted "J". We didn’t observe a proportional number of individuals in each circumference class. This demonstrates a prevalence in the initial classes of height and circumference reflecting anthropogenic actions and high reproductive capacity of these species.

FS02.P.31

Landscape genetics of Eremanthus erythropappus (DC.) Macleish (Asteraceae)

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Habitat fragmentation has negatively impacted natural tree populations, leading to disruption and loss of habitat. This discontinuity divides populations, interrupts the gene flow, leading to isolation, increasing the likelihood of local extinctions. Several approaches are available to infer the genetic variation in time and space and its relationship with the environment. The landscape genetics provides information on how landscape and environmental features influence population genetic structure. Aiming to identify genetic boundaries among natural populations of *Eremanthus erythropappus*, genomic DNA was extracted from leaves samples of 200 individuals from ten populations of this species in Minas Gerais State. ISSR (Inter Simple Sequence Repeats) primers were used to amplify the genomic DNA and Bayesian analyses were used to obtain the genetic data. The discontinuity of genetic data in relation to geographical space was based on genetic distances. The populations were located on a map, according to their geographical coordinates, and the Delaunay triangulation method was used to connect them in a network. Analyses were performed through Barrier v2.2 software. Six points of limit genetic among the ten populations were detected and identified as chains of mountains among populations. These geographical barriers may interfere in the gene flow of *E. erythropappus*, leading to the genetic differentiation in these populations.

FS02.P.32

Genetic structure and diversity in two populations of polyploid *Tibouchina pulchra* Cogn. (Melastomataceae) in an altitudinal gradient in the southeast of Brazil

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The genetic structure and diversity in plants may change in an altitudinal gradient, since different altitudes regulate different ecological conditions. For instance, bee-pollinator reproductive dependent *Tibouchina pulchra* receive less visits on higher altitudes. This difference in pollinator activity may influence the genetic structure of the population, given that in *T. pulchra* the pollen flow is restricted to the movement of the pollinators due to pronounced hercogamy. We evaluate the genetic structure and diversity of the populations of *Tibouchina pulchra* Cogn. (Melastomataceae) in two extremes of an altitudinal gradient: Núcleo Santa Virgína (NSV, high site, altitudinal range: 850-950m) and Núcleo Picinguaba (NP, low site, altitudinal range: 50-100m) of the State Park of Serra do Mar, using microsatellite molecular markers. Twelve polymorphic loci were developed and used to carry out analysis on 44 individuals at NSV and 45 individuals at NP. Since *T. pulchra* is a polyploid species, we used FDASH metrics for allopolyploids, Bayesian, AMOVA and multivariate analysis to measure genetic structure and diversity for both populations. The FDASH metrics, such as the number of phenotypes, indicated that genetic diversity is lower in the high site population (NSV=15.744 and NP=18.869, $p<0.05$). Bayesian analysis shows that the individuals of the higher site share just one predominant allelic pool and are similar among them. On the other hand, individuals of the lower site share 4 allelic pools and are more diverse. AMOVA indicated that 90.08% of the variation is within the populations, while 9.92% of the variation is between populations ($p<0.001$). Grouping and ordering analyses also showed the existence of genetic differentiation between the populations and smaller genetic diversity in the population of the higher site population. These results may be explained by the dynamics of gene flow mediated by movement of pollen through pollinator interactions in both populations.

FS03.P.01

Bird functional diversity and ecosystem services in tropical forests, agroforests and open agricultural areas

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Although most bird species avoid agricultural areas, nearly a third of all birds occasionally use such habitats, often providing important ecosystem services like pest control, pollination, and seed dispersal. Combining literature review with meta-analyses of the ecological characteristics of the world's birds, I compared tropical bird species that prefer forests, agricultural areas or both, with respect to body mass, diet, range and population size, frequency, conservation status, habitat and resource specialization. Compared to primary forests, species numbers of large frugivorous and insectivorous birds (especially terrestrial and understory species) often decline in agroforests. In contrast, nectarivores, small-to-medium insectivores (especially migrants and canopy species), omnivores, and sometimes granivores and small frugivores do better, frequently by tracking seasonal resources. However, changes in guild species numbers do not necessarily translate to changes in relative abundance, biomass or function, and more studies are needed to quantify these important measures. These findings indicate that the replacement of forests and agroforests with simplified agricultural systems can result in shifts towards less specialized bird communities with altered proportions of functional groups. These shifts can reduce avian ecosystem function and affect the ecosystem services provided by birds in agroforests and other agricultural landscapes.

FS03.P.02

Intrinsic biological features define diverse pathways to bird extinction in a megadiverse country

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To avoid species loss, scientists have focused their efforts on the mechanisms that make some species more prone to extinction than other. However, species show different responses to threats given their evolutionary history, behavior, and intrinsic biological features. Here, we aim to solve questions about the multiple pathways driving Brazilian birds' species to extinction, by investigating in how biological features interact, how extinction risk is geographically structured, and how much diversity is actually protected by the protected areas. We modeled the extinction risk of 1 557 birds using classification trees and evaluated the relative importance of each biological feature to predict extinction risk. We also quantified the proportion of species and their geographic range protected by the current network of Brazilian protected areas. The optimal classification tree showed different pathways to bird extinction. Range size, type of habitat, trophic guild and body mass were the most important biological features to define extinction risk. Species predicted to be under higher extinction risk are concentrated in the south and western part of Brazil and are not well represented in the established protected areas, having 30% of their range protected. Our model is an important conservation tool providing us a rule of thumb that can be broadly applied to predict the extinction risk of birds. Predictive models could help more in conservation actions and we hope our results can contribute to highlight the importance of natural history and ecology in these actions.

FS03.P.03

Geographic variation in song of a widespread neotropical bird: Implications for biogeography and conservation

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The Black-faced Antthrush (*Formicarius analis*) is generally treated as a polytypic species that ranges from southern México south through Amazonia and to Perú. It occurs from lowland rainforest near sea level to evergreen humid foothill forest to 1700 m elevation. Plumage and size are relatively uniform across its vast range, but on a finer scale diagnosable differences among geographically separate populations has led to the recognition of 14 subspecies. A fascinating aspect of this variation is existence of three song types in which dominant frequency is consistent but cadence is highly variable. Song divisions occur among populations in 1) northern Middle America (*moniliger* group; 3 subspecies), 2) southern Central America and northwestern South America (*hoffmanni* group; 4–6 subspecies), and 3) much of South America (*analis* group; 6–8 subspecies). Song of birds isolated in montane forests of northeastern Venezuela was previously unknown but was conjectured to be like that in South American populations to the south. We secured the first recordings of these birds and learned that their song type varies from resembling that of Central American birds to that of South American birds, with most of intermediate form. Our finding may alter understanding of the historical link between the fauna of Central America and the northern edge of South America. Alternatively, the isolated Venezuelan populations may constitute an undescribed species, highlighting the critical need for biodiversity exploration and conservation in this region.

FS03.P.04

An evidence-based framework for reintroducing captive-bred cracids

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Curassows, guans and chachalacas represent one of the most threatened bird families in the Americas. These large, predominantly frugivorous species are largely dependent on primary forest habitats and represent a major protein source for rural indigenous people and have been widely hunted for food over many years. Habitat loss and degradation and unsustainable human exploitation have caused major cracid population declines throughout Central and South America. Currently, one species is listed as being Extinct in the Wild and 16 are listed as Critically Endangered, Endangered or Vulnerable. Fortunately, cracids readily breed in captivity, and five species have been reintroduced in the Brazilian Atlantic Rainforest, the world's most threatened forest biome. Little information has been garnered from these reintroductions, principally because of lack of post-release monitoring. The reintroduction of red-billed curassows *Crax blumenbachii* in Guapiaçu Ecological Reserve (REGUA, Rio de Janeiro state, Brazil) occurred between 2006 and 2008. All 48 birds were tagged with radio transmitters which battery lasted 2.5 years, and important data on survival, animal movements, social interactions and habitat selection was recorded. Our aim is to present an evidence-based framework which practitioners can use in a more strategic, question-based approach to cracid reintroduction science for conservation purposes. We structured our framework following three stages: Feasibility, Pre-Release/Release and Post-Release. We illustrated the framework with a series of model diagrams, by drawing together the best practices and key research findings from the detailed post-release analysis of the red-billed curassow reintroduction programme at REGUA and Crax Brasil's experience. The documentation of lessons learned from reintroductions helps prevent future mistakes and wasting limited resources. Therefore our framework may contribute for increasing chances of success of future reintroductions of critically endangered cracid species such as blue-billed curassows *Crax alberti* in Colombia and the extinct in the wild Alagoas' curassow *Mitu mitu* in Brazil.

FS03.P.05

THE EFFECTS OF WILDFIRES ON BIRD COMUNITIES IN BRAZILIAN AMAZON

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We reported the findings from investigations of the effects of wildfires on bird communities and populations of four sites in the Brazilian Amazon. The presented data cover a relatively broad-scale, comparing four different regions spaced more than 900km between sites, and include information about long-term effects of fire on Central Amazonian bird communities and populations. We also focused on possible population and individual stress in North and Central Amazonian sites, measured by asymmetry, weight, and abundance of ectoparasites in burned and unburned areas. We evaluated the effects of wildfires by sampling 12 areas per site by 28 mist nets and 96 point counts. Our overall findings suggested that wildfires strongly influence bird community structure in some parts of the Amazon (North and Central Amazonia), possibly because these areas are not adapted to fire. We also found that tropical fires directly influence the abundance of different bird species at all studied Amazonian sites. Additionally, we found that wildfire effects in Amazonian forests are persistent, directly influencing the populations of birds that use these habitats even 10 years after a single fire event. However, we did not observe broad signals of stress on bird condition (or fitness) of populations living in burned compared to unburned sites. The impacts of wildfires in Amazonian bird communities are important and persistent, and need to be emphasized in further studies and conservation management strategies.

FS03.P.06

Patterns and processes in the structure of nectarivorous bird communities

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Ecological, historical and evolutionary processes define the composition of communities. Specialized nectarivorous birds are found in communities at many regions of the world, from which we can highlight three main families: Trochilidae, Nectariniidae and Meliphagidae. Here we review patterns and processes that operate on the composition of communities of these three groups. The strong morphological and behavioral similarities among the three families had evolved by adaptive convergence for the nectar feeding. Geographic barriers limited the dispersal of species at large (continents) and medium (e.g. two sides of the Andes) scales. Some fossil evidences suggest that historical factors (e.g. climate change) may have also played an important role in the extinction of nectarivorous birds. In small scale (local communities) the three groups are predominantly structured by competition between birds and mutualistic interaction with plants. Recurring patterns at local scale in the three groups are spatial (habitat, altitude) and behavioral segregation (gradient between exploitation and direct interference), as well as segregation by resources (floral morphology and gradients of nectar abundance). Predation and pathogens (parasites and diseases) affect the survival of both nestlings and adults in these groups but their effect for community structure remain largely unexplored. Our review highlights that the similarities between the three major groups of nectarivorous birds go beyond the morphological and behavioral similarities. Patterns of community structure are also similar. We expect that advances in studies of communities of Nectariniidae (the less studied group until now) will continually reinforce these convergent patterns. Furthermore, the inclusion of innovative approaches such as phylogenetic structure of communities and consideration of facilitation processes will improve the knowledge on nectarivorous bird communities in the coming years.

FS03.P.07

Temporal variation in bird assemblage in an area of abandoned pastures in a Tropical Dry Forest in state Minas Gerais

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Tropical Dry Forests (FTS) are still poorly studied despite representing approximately 42% of tropical forests. The mining FTS have a history of anthropogenic disturbance due to logging and use of areas for grazing. Consequently, these fitofisionomy constitute a mosaic of vegetation in different stages of secondary regeneration. These study evaluated changes in bird assemblage during the first years of regeneration of a pasture area, originally covered by FTS in the State Park Mata Seca, Manga city, north of Minas Gerais (14 ° 97'02 "S-43 ° 97'02" W and 14 ° 53'08 "S-44 ° 00'05" W). Sampling occurred between October 2008 and December 2011, totaling 14 campaigns. The birds were captured with mist nets, identified and banded. To evaluate the influence of regeneration in richness and abundance of birds between years were constructed GLMs and composition was compared using NMDS, followed by ONE-WAY ANOSIM test. Analyses were performed in R statistical software and Past, respectively. We captured 1270 individuals from 67 species. There was an increase of richness and abundance of birds over the years, which may be related to the broader spectrum of available resources, such as the emergence of herbaceous and shrubs. Furthermore, the high abundance of granivorous and omnivorous species are associated with greater availability of herbaceous, justifying the high catch rates of these species, especially *Volatina jacarina* and *Lanio pileatus* (n= 502 e 166). The composition was similar between the first two years, differing from the latter two, which showed 34 new species. Of these, some may be directly related to the regeneration process, since they are potential seed dispersers. Thus, this study revealed a rapid change in the bird community, in view of the long process of succession, indicating the important role of birds in the process of regeneration of degraded areas in Tropical Dry Forests.

FS03.P.08

Diversity of birds in three urban lakes with different degrees of conservation from Campo Grande, Mato Grosso do Sul, Brazil

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The environmental degradation and urbanization that the Cerrado has suffered has had a major impact on avifauna. In Campo Grande, Mato Grosso do Sul (MS) there are three major lakes in the urban area, each with different degrees of conservation for the riparian vegetation: the Lago do Amor and Parque das Nações Indígenas Lagoon, both artificial lakes, and Lagoa Itatiaia, a natural lake. The aim of this study was to evaluate the richness, diversity and abundance of avifauna surrounding these Lakes. A 1000 meters path was walked during the morning and the afternoon around each lake, totalizing 102 hours of observations between January and September 2010**.** 6,512 birds were recorded comprising 88 species, belonging to 33 families. Among the families observed, Tyrannidae, Hirunadinidae, Columbidae, Ardeidae and Anatidae were the most represented. Lago do Amor had the highest diversity index, density and the largest number of individuals (H '= 3.414, ID = 18381.48, n = 4963), followed by Parque das Nações Indígenas Lagoon (H’ = 2.625, ID = 2885.19, n = 771) and Lagoa Itatiaia (H’ = 2.693, ID = 2851.85, n = 770). The greater similarity between Lagoa Itaitaia and Parque das Nações Indígenas Lagoon (60%) can be explained by the similarities in the structural vegetation surrounding the lakes. Unlike Lago do Amor which has half of its banks surrounded by dense and heterogeneous vegetation including many trees, both Lagoa Itatiaia and Parque das Nações Indígenas Lagoon are surrounded almost exclusively by Poaceae and have virtually no trees lining their banks.The occurrence of typically urban species was low even in the most urbanized lakes. Several species dependent on more preserved environments were recorded, indicating that these sites, even highly degraded, can function as biological islands, playing a role in keeping the avifauna and maintaining biological diversity in urban environments.

FS03.P.09

The functional role of birds and bats in the regulation of arthropods in productive systems of cacao (*Theobroma cacao* L., Malvaceae) in southern Bahia

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Predators have an important role in down regulation of herbivorous arthropods. Despite this, few studies attempted to understand the role played by these bats in the population control of arthropods, focused mainly in birds. For this reason, this study examines the importance of birds and bats in the control of arthropods in cocoa, as well as distinguishes whether this role has no difference between crops with different managements. We selected the city of Itajuípe/Bahia, two cocoa plantations, a cabruca (agroforestry shaded by native canopy) and a little shady, and in each of four blocks were established for sampling, in which four individuals were selected for *Theobroma cacao* following treatments: 1. control, with no exclusion of birds or bats 2. exclusion of birds 3. exclusion of bats 4. exclusion of birds and bats. The experiment lasted six weeks and arthropods were recorded weekly in the individual's leaves. Data were analyzed with generalized linear model (GLM). There was a significant increase in the abundance of arthropods along the experiment in treatments excluding bats and birds / bats in traditional crop has not been observed in the same relation to bird exclusion experiment. In cocoa plantation shaded little any of the treatments interfered with the abundance of arthropods, indicating that the population control of these arthropods is mediated by other factors. Predation of arthropods of cocoa carried by bats in cabruca can show a great functional importance of this group as natural controllers of arthropods in the production system with high conservation value. Populations of bats are being reduced at an alarming rate across the globe and loss of guild can cause great damage to agriculture due to the ecological function they perform.

FS03.P.10

Effects of agroforestry system cabrucas in fruit consumption by birds in two contrasting landscapes of southern Bahia, Brazil

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The most part of the zoochorous fruits from the Brazilian Atlantic Forest are dispersed by birds. That is the reason why threats to birds families as fragmentation and habitat loss are a challenge for the conservation of plants. Forms of land use as agroforestry, which keeps part of the tree structure of the native forest, are an opportunity to combine agricultural development and biodiversity conservation. Thus, this study aimed to evaluate the influence of forest cover and agroforestry systems in fruit consumption by birds. The study was conducted in two landscapes of the southern of Bahia. In the landscape A there is a predominance of forests, while in the landscape B there is a higher percentage of cocoa agroforests (cabrucas). In each landscape were taken samples of three forest fragments and three cabrucas. In each area were placed 25 stations consisting of 15 artificial fruit tied on bushes. The experiments were checked after 72 hours, and evaluated the consumption and detection in the areas. Analysis of variance of two factors were used for comparison of mean consumption of fruit among areas, logistic regression models were used to evaluate the relationship between detection and habitat. The consumption and detection of fruits were different among landscapes. More fruits were consumed and detected in the landscape A, but no differences were found in consumption between habitats within the landscape. The results of this study reinforce the importance of forest covery to maintain ecological processes in agricultural landscapes, and highlights that the landscape in which agroforestry are located has great influence on the role played by these habitats. Thus, only the evaluation of the ability of cabrucas harboring bird species and maintaining ecological interactions is insufficient for the development of conservation strategies.

FS03.P.11

Improving acoustic detection of tropical birds: a comparison of automated and manual identification methods

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Autonomous recording of animal vocalization is an increasingly popular and useful technique for biodiversity assessment. With this technique researchers can collect and permanently store large amounts of data from multiple simultaneously sampled sites without the need to send experts to every site. Nevertheless, the laboratory identification of species in autonomous recordings does demand substantial time and skill from trained experts. Computer-based automated identification of vocalizations offers a potential alternative to 'manual' processing of large amounts of data; however, as automated identification is still a developing endeavor with inevitable imperfections it makes sense to ask whether the increased processing speed makes up for possible losses in identification ability. We report on a comparison between manual and automated processing of recordings from 151 *terra firme* Amazon forest sites at the Biological Dynamics of Forest Fragments Project, near Manaus, Brazil. Our analysis focused on the estimation of site occupancy by the variegated antpitta, *Gralaria varia*, and the slate-capped shrike vireo, *Vireolanius leucotis*. Our occupancy estimates account for the possibility of detection failure (i.e. not detecting a species that is actually present at a site) and their precision is strongly influenced by the amount of data and by the ability to accurately identify species. 'Manual' processing consisted of listening to 60 recording hours, while automated processing was based on the application of Hiden-Markov Models to 450 hours of recordings using software from the Automated Remote Biodiversity Monitoring Network. We conclude that, for both species, despite the relative loss of detection probability per unit recording time, the extra sample size afforded by automated identification leads to more precise estimates of occupancy and thus a more efficient use of time.

FS03.P.12

BIRD SPECIES IN URBAN AREAS IN THE SOUTHERN REGION OF THE BRAZILIAN ATLANTIC FOREST

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We evaluated the potential of occupancy of urban areas by birds in the southern portion of the Brazilian Atlantic forest. Although several studies on birds of urban areas have been developed, a review of the principal findings is not yet done. We found 76 studies related to birds in urban areas in the region of the Brazilian Atlantic forest (1990-2010). The majority of those studies are related to spatial distribution (47.8%); the other studies are on behavior (25.3%), mainly reproductive Biology, and simple check-lists (20%), beside others (6.9%). We selected 22 studies which authors performed year long studies and produced rather complete lists of local richness. Than, we analyzed if a north-south gradient could be detected, for all avifauna and for each bird family, on the potential of occupancy of urban habitats. 669 bird species are potentially recorded in the study region (we excluded of our analysis aquatic bird species); 331 (50%) of those species were recorded in urban areas. We found that in general the percentage of species recorded in urban areas, related to the potential local richness, decreases from south throughout north. Such tendency was also found separately in each familie, excepted in: Columbidae, Psittacidae, Trochilidae, Furnariidae, Tyrannidae, and Icteridae. The high number of bird species found in urban areas of the Brazilian Atlantic forest region could be credited to the occurrence of small reserves in urban areas. So, urban areas could be important for conservation of certain bird species in the cities on the Brazilian Atlantic Forest, since green areas be maintained.

FS03.P.13

RECORD AND DESCRIPTION OF A NEST OF THE BARRED ANTSHRIKE (Thamnophilus doliatus) (Aves: Passeriformes) ON THE URBAN AREA OF CAMPO GRANDE, BRAZIL

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The Barred Antshrike (Thamnophilus doliatus) is a common and widespread passerine that belongs to the Thamnophilidae. They are often observed in pairs, on the top of small trees or in the intermediary forestal layers, forest edges or even on shrubs in open and urbanized areas. However, the nesting components of this species are poorly known. Moreover, the nest description has shown as an important tool in studies of conservation, phylogeny and evolution of birds. In this study, we described a nest built on the terminal branches of the *Psychothria cathargenesis* (Rubiaceae), located on the Campus of the UFMS, Campo Grande, Brazil. The nest was placed over 1,45 m of the ground and showed a low cup shape, with horizontal fork support. The nest's dimensions were obtained with a caliper, and then, segregated. The weight of the components were obtained by using a semi-analitic scale. It shows 52,33 mm of height and 99,22 mm of width, with total weight of 4,292 g. The nest components description revealed 270 pieces, which were grouped into three categories according with material origins: vegetable (264 pieces – 4,108 g), industrialized (4 pieces – 0,184 g) and animal (2 pieces – insignificant weight). The presence of industrialized materials has also been described by some authors for other bird species and showed that *T. doliatus* presents some ecological plasticity to build nests.

FS03.P.14

Feeding ecology of Tucuman parrot *Amazona tucumana*

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Parrots are primarily canopy granivores that may experience variability in food availability due to the seasonality of canopy trees. Understanding the relationship between parrot populations and their feeding resources will enable to determine the resources, habitats, and areas to conserve. Few studies have focused on Neotropical birds inhabiting montane forests in terms of feeding patterns and changes in food availability along an elevation gradient. Tucuman parrot is a species restricted to the Southern Yungas. The aim of this work was to determine the diet and foraging patterns of Tucuman parrot and to relate those data with temporal and spatial variability in food availability along the elevation gradient of the Southern Yungas. During four years we studied the feeding ecology of Tucuman parrot in El Rey National Park, Salta Province, Argentina. Diet and foraging patterns were determined by direct observations of feeding activity. Chicks were monitored to identify the dominant species in their diet. Resource availability was determined on each of the three elevation zones of the Southern Yungas. We recorded a total of 174 feeding bouts of 2562 individuals feeding for a total of 3984 min. Tucuman parrot diet in the study area is composed of 14 native species of nine families. Tucuman parrot was found to be primarily (56%) granivorous, consuming mainly seeds of *Podocarpus parlatorei* in the reproductive period, leguminous seeds in the non-reproductive period, and inflorescences of *Juglans australis* during the pre-reproductive period. Tucuman parrot exhibited a marked seasonal dietary switch while tracking food availability along the elevation gradient. Crop contents of chicks included more than 95% of seeds of *P. parlatorei*, showing a highly specialized diet. Tucuman parrot productivity might be influenced by the availability of seeds of *P. parlatorei*. Therefore, the conservation of Tucuman parrot is linked to the maintenance of stands of *P. parlatorei*.

FS03.P.15

A Comparison of *Eleutherodactylus coqui* Calling Activity in Two Sites in Puerto Rico Using ARBIMON's Automated Species Identification Software

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Reliable long-term data over large spatial scale are needed to understand the impact of global change. Fortunately, new technologies are providing opportunities to improve our knowledge of the distribution, abundance, and activity patterns of the fauna. In this project we evaluate the activity patterns of the common frog, *Eleutherodactylus coqui*, in two sites based on calls recorder over a four year period. In Puerto Rico, *E. coqui* has a wide distribution from cities to montane forest, and in this study we compared activity patterns in El Verde, a closed canopy forest and Sabana Seca, an herbaceous wetland. Recordings were collected using the ARBIMON's permanent audio recording system, from March 2008 to March 2012. *E. coqui* calling activity was measured using the Automated Remote Biodiversity Monitoring Networks (ARBIMON) automatic species identification hardware/software, which records 1 minute of audio every 10 minutes (144/day). These recordings were processed using the ARBIMON software for modeling species calls. The models were created and trained using Hidden Markov Models, and validated with 824 recordings and 567 recordings for El Verde and Sabana Seca, respectively. In El Verde, *E. coqui* was detected in 64,564 of 105,041, 1-minute recordings, while in Sabana Seca the model detected *E. coqui* in 54,008 of 127,170 1-minute recordings. The activity patterns between the two sites were significantly different. Although in both sites, the majority of calling occurs between 19:00-5:00, in El Verde a low level of calling continued throughout the day, while in the more exposed wetland of Sabana Seca there was virtually no calling activity between 09:00-14:00.

FS03.P.16

Impact of landscape structure on the foraging behavior of the King Vulture

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Seasonal tropical forests of the southern Yucatan Peninsula are dynamic ecosystems under great pressure from human activities. The spatial heterogeneity resulting from the fragmentation of these forests should have important effects on the process of habitat selection. In species with large home ranges, such as the King Vulture (*Sarcoramphus papa*), an avian scavenger of neotropical forests, the selection of feeding sites can be influenced by landscape composition and configuration at different scales. Although this species has been observed feeding on carcasses in both forested (Lemon 1991) and open areas (Clinton-Eitniear 1981), mechanisms underlying the King Vulture's choices of feeding sites are poorly understood. This study aims at understanding the effects of landscape structure on the feeding strategies of the King Vulture. To achieve this goal, carcasses were installed in the southern Yucatan Peninsula according to a paired design, in summer 2010 and spring 2011. Use of carcasses was assessed at two spatial scales. At local scale, two types of environments were considered in the analysis (open and forest). At a larger scale, the relative surface of different habitat types and their configuration in the landscape were estimated. Other variables, such as the distance to closest road and village were included in the model. Results indicate that landscape composition and related interspecific competition have an impact on the foraging behavior of the King Vulture. Understanding the ecological impacts of changes in landscape structure will facilitate the design of conservation strategies for this species, which provides many vital ecological services.

FS03.P.17

Secondary Forest Structure and abundance relationship in three neotropical owl species

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During the rainy season of 2010 and the dry season of 2011, we examined the composition of owl species in an altitudinal gradient within in the Pacific Slope of Costa Rica. We employed the playback survey method using conspecific vocalizations of owl species to estimate their composition, frequency of detection and relative abundance of owl species in three secondary tropical stands of forest distributed from sea level to 2100m. The first stand of forest in lowland areas is in the Piedras Blancas National Park, the stand of forest at mid elevations is in the Guyamí Indigenous Territory, and the thirsd stand at high elevations is in Las Tablas Protected Zone. The study was based on the classification of life zones developed by Holdridge. We set up 16 points in two trails at each forest fragment, eight points per trail, and each point 400m apart to each other. We detected eight species total (*Megascops guatemalae, M. clarkii, Glaucidium costaricanum, Lophostrix cristata, Strix virgata, S. nigrolineata* y *Aegolius ridwayii*). The detected and expected species richness was different at the three forest fragments. While differences in species abundance were not significant in the rainy season, there were differences in the dry season for the abundance of *Strix virgata* ($H = 78.0326$, $P < 2.2e-16$) between the three elevations. There is a greater overlap of owl species among the middle/lower forest areas, and lower among the lowland forest and upland forest. The detection rate varied between species and between forest stands, with *Strix virgata* detected most frequently in the lowlands and intermediate lands, and with higher abundance than other owls in the three stands of forest. By contrast, *Lophostrix cristata* had lower frequency of detection and lower abundance in two of the three studied forests during the rainy season, nevertheless during the dry season the abundance of this specie increased significantly in the Parque Nacional Piedras Blancas ($U = 5089$, $P = 0.005591$). There were records of *Pulsatrix perspicillata* outside the sample areas in the rainy season. There is no variation of the number of species in relation with the elevation, but there was variation in the species composition between the three altitudinal levels. The tropical secondary forest is an important habitat for owls during rainy and dry season.

FS03.P.18

Using genetic variation to infer the history of *Coereba flaveola* in the West Indies

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The sizes and distributions of populations vary over time, and episodes of expansion and contraction create characteristic patterns of genetic variation. Consequently, contemporary patterns of genetic diversity open a window onto demographic history. Here, we employ population genetics approaches to infer the demographic history of the bananaquit, *Coereba flaveola*, in the West Indies, which is composed of the Greater Antilles to the northwest and the Lesser Antilles to the southeast. The bananaquit is a small nectivorous and frugivorous bird, abundant throughout the archipelago. We analyzed genetic variation in two mitochondrial genetic markers (cytochrome b and ND2) for ca. 23 individuals on each of fourteen islands. Tajima's D, Fu's FS, mismatch distributions and Bayesian skyline plots were used as indicators of population change, supplemented by signature shapes in haplotype networks. The latter, as well as a rooted Maximum Likelihood phylogeny, were used to infer relationships among populations. The Greater Antillean islands of Jamaica and Cayman Brac Island, and the southernmost Lesser Antillean islands of Saint Vincent and Grenada show evidence of stable populations, whereas the northern Lesser Antillean islands in between have clear signs of expansion. Based on the phylogeny, expansion signatures and geography of the eastern antillean islands, we can hypothesize that once a cohesive population existed from Puerto Rico (PR) to Saint Vincent and Grenada (SV/GR). However, at some point, haplotypes from either PR or the SV/GR group recolonized the northern half of the archipelago that lies between PR and SV/GR, now forming a distinct group. These demographic patterns of expansion, contraction and re-expansion show evidence that the species is an example of taxon cycle in the archipelago. Using a combination of population genetic approaches this study provides detailed insight into the demographic and geographic history of the bananaquit among island populations.

FS04.P.01

The effect of predator functional diversity on ecosystem function in bromeliad food webs.

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Predators play a critical role in many ecosystems; their presence can have profound effects on community assembly and enhance nutrient cycling. However, we know little about the complex effects of multiple predators at once. The effect of a diverse predator assemblage will depend on functional traits which may be conserved within clades; phylogenetic diversity is therefore a potentially useful metric of predator functional diversity. The phylogenetic diversity of predators may therefore be positively correlated with their additive and non-additive effects on a community.
We present results from a manipulation of predator phylogenetic diversity in an aquatic food web. The phytotelmata in the leaves of *Quesnelia arvensis* bromeliads contain a diverse community of insects, including several species of predators which feed on detritivorous invertebrates. We filled bromeliads with a standard prey community and manipulated predator diversity by combining predators in species pairs that represented a range of relatedness: congeners (two congeneric damselflies, *Leptagrion andromache* and *Leptagrion elongatum*), two insects (a damselfly, *Leptagrion elongatum*, and a predatory fly (Tabanidae)) and two invertebrates (*L. elongatum* and leeches). We also included these four species in monoculture, along with a predator-free control (8 treatments, n=5). Combinations were substitutive. Response variables included the rate of decomposition of leaves, bromeliad growth and insect emergence.
We found that predator phylogenetic diversity was negatively correlated with prey consumption: the mean prey survivorship in polycultures increased (i.e. approached the survivorship in predator-free controls) as predator phylogenetic diversity increased. This suggests that increasing phylogenetic diversity leads to interference between predator species. While no effect was found on decomposition (overall decomposition was very low), forthcoming results will also include an analysis of the rate of nitrogen cycling from detritus to bromeliad tissue.

FS04.P.02

Broad Scale Distribution of Ferns and Lycophytes along Environmental Gradients in Central and Northern Amazonia, Brazil

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Establishing which factors determine species distributions is of major relevance for practical applications such as conservation planning. The Amazonian lowlands exhibit considerable internal heterogeneity that is not apparent in existing vegetation maps. We used ferns as a model group to study patterns in plant species distributions and community composition at regional and landscape scales. Fern species composition and environmental data were collected in 109 plots of 250 m x 2 m distributed among four sites in Brazilian Amazonia. Interplot distances varied from 1 to ca. 670 km. When floristically heterogeneous datasets were analyzed, the use of an extended Sørensen dissimilarity index rather than the traditional Sørensen index improved model fit and made interpretation of the results easier. Major factors associated with species composition varied among sites, difference in cation concentration was a strong predictor of floristic dissimilarity in those sites with pronounced heterogeneity in cation concentration. Difference in clay content was the most relevant variable in sites with uniform cation concentrations. In every case, environmental differences were invariably better than geographic distances in predicting species compositional differences. Our results are consistent with the ideas that 1) the relative predictive capacity of the explanatory variables depends on the relative lengths of the observed gradients and 2) environmental gradients can be hierarchically structured such that gradients occur inside gradients. Therefore, site-specific relationships among variables can mask the bigger picture and make it more difficult to unravel the factors structuring plant communities in Amazonia.

FS04.P.03

BIOMASS VARIATION OF *Chara indica* BERTERO EX SPRENG. (CHAROPHYCEAE) IN CAATINGA SPRINGS OF THE BRAZILIAN NORTHEAST

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Chara indica Bertero ex. Spreng (Charophyceae) is a macroalgae which presents considerable frequency in the springs of Caatinga. Bearing that in mind, this paper aimed to analyse the species' biomass in springs located in the area of the Project of Integration of the São Francisco River – PISF. The biomass was collected during the dry season in 10 random parcels of 0.25 m² (0,5 x 0,5 m) in the Engenheiro Ávidos Reservoir, PB (S07°00'44,80" W038°27'12,80" 324 m alt.) and in the captation area of the São Francisco River, PE (S08°48'00,10" W038°23'28,70" 304 m alt.). The hydrogen-ionic potential (pH), depth and turbidity were measured. After separating the materials and weighing the fresh and dry samples, the data were submitted to variance analysis (ANOVA) and canonian correspondence analysis (CCA) to relate the biomass to the physic-chemical parameters of the water. In the Engenheiro Ávidos Reservoir, the fresh mass (23.28 $\pm$ 21.15g/m²) and the dry mass (3,07 $\pm$ 2,7 g/m²) were similar to the captation; the fresh mass (20.18 $\pm$ 30.7g/m²) and dry mass (7.4 $\pm$ 9.9g/m²) did not differ significantly, fresh mass H= 8.02, p = 0.01 and dry mass H= 11.49, p= 0.003. The captation area presented in average alkaline pH, whereas the Engenheiro Ávidos Reservoir presented a slightly acid pH; both presented translucid waters and the maximum depth reached 0.5 m. Note that the accumulation of biomass did not differ significantly when the pH was between 6.1 and 7.4 and is negatively associated to the water turbidity and depth. It can be concluded that *C. indica* accumulates a higher quantity of biomass in translucid, slightly alkaline, and less deep waters.

Keywords: Biomass, Charophyceae, Caatinga, Reservoir

FS04.P.04

A comparative study of aboveground allometries and biomass allocations between bamboos and trees in tropical rainforests of South East Asia

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In a light limiting environment such as an under canopy of a tropical rainforest, the plant architecture is a key factor which relates with the strategy of light capture and the life-history. Studies of the plant architecture have dealt with mostly dicot trees which have the secondary growth, and those frameworks are not compatible with plants who lack the secondary growth. This study compared the allometries and the biomass allocations between trees and bamboos in SE Asia, and deduced strategic differences between plants with and without the secondary growth. In Peninsular Malaysia, architecturally contrasting two bamboo species, *Gigantochloa ligulata* and *Schizostachyum grande*, were observed their architectural traits: height, crown area and ramet size distribution. From each observed bamboo, one representative ramet was harvested in order to measure and estimate the biomass allocations on leaves, branches and culm. Our observation was compared with a data quoted from Yamakura *et al.* 1986 which investigated 49 species of trees, applying standardized major axis regression. As a result, the bamboos showed more branch weighted allocations than the trees, and more leaf and height were supported by relatively smaller amount of supporting organs than the trees. At a genet scale, the bamboos showed wider crown area than trees which have same biomass as the bamboos, and the leaf area index of the bamboos were same or slightly less than that of the trees. Flexibilities originated from the absence of the secondary growth may account for those preferable characteristics of the bamboos, as their architectures complete within one ramet longevity instead of inheriting the past growth and forming a future growth template. This study shed light on the bamboos' architecture and proposed a possibility of their architectural advantages.

FS04.P.05

REVEALING THE CAUSES AND TEMPORAL DISTRIBUTION OF TREE MORTALITY IN THE CENTRAL AMAZONIA

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We analyzed the causes and temporal distribution of tree mortality in 10ha of primary forest located in Central Amazonia. The study aimed to (1) reveal the main causes of tree death, and (2) describe the variation in mortality over time and correlate it with climatic variables. The work was conducted in two transects of 20x2,500m where all individuals with DBH≥10cm were observed, totaling 5,808 trees. The transects were monitored every month, from Nov./2010 to Out./2011. The health conditions of the living trees were monitored every month. Tree mode of death (standing, snapped or uprooted) was assigned for all dead trees. The health condition, before and after death, was analyzed in order to identify the cause of tree death. During one year, 67 individuals died and the mortality rate was 1.15%.year^{-1}. From those, 24 were uprooted, 23 snapped and 20 died standing. Mortality rate was positive and highly correlated with month rainfall (r=0.85). Therefore, the events of death were more frequent in the rainy season. The correlation between mortality and wind speed was not as strong as expected (r=-0.29), and the direction of the individual treefalls was random. During the study period, one of the most severe droughts was reported for Central Amazon, but *Storms* (rain+wind) was the main cause of tree death, accounting for 45% of the deaths. Close behind was *stress and biotic factors*, killing 20 of the 67 dead individuals. Of these 20 trees, one was killed by liana and 3 died from infestation by pathogenic fungi. The results indicate that is possible to determine the cause of trees death in tropical forests, elucidating the effect of seasonal variations on mortality. The work has generated new information about Amazon forest, and we suggest that improved tree mortality studies should be included in the projects of forest dynamics.

FS04.P.06

HANDROANTHUS SPONGIOSUS (RIZZINI) S. GROSE (BIGNONIACEAE): A SPECIES ON THE BRINK OF EXTINCTION?

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Handroanthus spongiosus (Bignoniaceae) is a species currently is categorized as “data deficient” according to the list of species of Brazilian flora under risk of extinction. The analysis of the structure and size of the natural populations of a species and the stability of these populations, are still insufficiently tested to infer about the conservation status of the species, in spite of being relevant factors. The aim of this paper was to evaluate the conservation status of *Handroanthus spongiosus*. To do so, the natural occurrence area of the species was evaluated through the modeling analysis of the ecological niche, making use of the Maxent algorithm and the biometric structure of seven populations occurring in the States of Pernambuco and Bahia. Ten parcels of 25 m^2 were allocated with the presence of *H. spongiosus* and in the interior of these sampling units; all the taxa specimens were sampled. The niche modeling demonstrated that *H. spongiosus* presents a restricted distribution. For the classes of diametric frequency, there was a high concentration of individuals in the first class in four of the seven municipalities studies, which is represented by regenerating individuals; the contribution of this class reached 98.3% in one of the populations, whereas the other classes reached values always lower than 5% in all areas. A similar response was obtained for hypsometric distribution, whose first class presented 96.4% of individuals in one of the studied sites. Despite the relevant number of regenerating individuals, these results suggest a low recruitment of young plants, which might compromise the formation of reproductive individuals of *H. spongiosus*. The evidence presented here, associated to the restricted geographical distribution of the species, categorize it as a vulnerable species under risk of extinction, according to IUCN.

KEYWORDS: extinction, modeling, stability populations.

FS04.P.07

Floristic similarity between semideciduous seasonal forests inserted in different agricultural matrixes, Southeastern Brazil.

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We did this study in Corumbataí River Basin, São Paulo, Southeastern Brazil (22°41'28"S and 47°56'15"W) - FAPESP 2011/06782-5. The original vegetation of this region has been drastically reduced, nowadays it has been restricted to small and isolated seasonal semideciduous forest fragments. Although highly degraded, they present a great richness of tree and shrub species, which justify their conservation through ecological restoration practices. In this sense, we described and compared the composition of shrubs and trees in the edges of 12 forest fragments inserted in matrixes dominated by sugar cane and consolidated tropical pastures. We collected data in 30.0 m x 8.0 m 60 plots that were systematically sampled (five plots per forest community). We sampled plants with diameter at breast height (DBH) ≥ than 5.0 cm, in a total area of 1.44 ha. We proceed to similarity analysis between floristic compositions of sugar cane forest remnants and pasture ones through UPGMA, and Jaccard's Index. We found 1990 trees, belonging to 163 species (46 families). Jaccard's Index showed a similarity of 45% between floristic composition of fragments inserted in sugar cane and pastures, indicating that the kind of matrix in this landscape does not influence the floristic composition. The results showed three distinctive groups, considering 25% of similarity. We observed that the highest similarity was 40%, the lowest one was 12%. We thought that such a high floristic similarity between forest remnants may guide future ecological restoration strategies, considering land use, and minimizing edge effects. We intend to generate a list of shrub and tree species to be accessed like a guide of restoration practices.

FS04.P.08

Composition of the phanerogamic flora of APA Mata do Krambeck in the Botanical Garden of the Federal University of Juiz de Fora, Minas Gerais, Brazil

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According to recent publications about the vegetation of Juiz de Fora, we could note that the floristic composition of its herbaceous and understory strata is related to the ombrofile formations of the state of Rio de Janeiro, creating questions about how to classify those remainings such as Seasonal Semideciduous Forests, as suggested by the recent literature. Therefore, local floristic studies are essential to support an accurate phytogeographical classification of the municipality vegetation. To contribute to this perspective we collected in the area of Krambeck Forest in the UFJF Botanical Garden fertile phanerogamic material, during one year of fortnightly random collections, travelling to all sides and slopes of this totally urban remnant with about 280 ha. The material was herborized, overthrown in CESJ Herbarium and identified according to the APG III. We found 422 species and the most representative families were Asteraceae (35 *spp*), Rubiaceae (32 *spp*), Melastomataceae (31 *spp*) and Solanaceae (28 *spp*). Regarding the habit, about 46% of the species are arboreal, 23% herbaceous, 16% shrubs, 9% lianas and 5% epiphytes. The results showed the presence of understory species common to ombrofile formations, such as *Myrciaria glazioviana* (Kiaersk) Barroso ex Sobral, *Psychotria malaneoides* Müll. Arg., *Psychotria nuda* (Cham. & Schltdl.) Wawra and *Solanum concinnum* Sendtn, suggesting that the forests of the UFJF Botanical Garden can represent a transition area, although the composition of the arboreal stratum reveals pioneer and generalist species, like *Piptadenia gonoacantha*(Mart.) J.F.Macbride, *Xilopia sericea* A.St.-Hil. and *Vernonanthura divaricata* (Spreng.) H.Rob., reflecting a slow process of natural regeneration, since the area was naturally revegetated after the abandonment of coffee plantation for nearly 70 years, and showing that, although extensive territorially, the APA Mata do Krambeck has an impaired arboreal flora, in need of further studies to its actual conservation.

FS04.P.09

ASPECTS OF THE BIOLOGICAL INVASION OF NICOTIANA GLAUCA GRAHAM (SOLANACEAE) IN THE BRAZILIAN SEMI-ARID

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The species *Nicotiana glauca* Graham is originally found in Argentina and Bolivia, however it is spontaneously distributed in different regions of the globe, especially those dominated by dry forests. The studied area is located in the Eastern Axis of the Project of Integration of the São Francisco River with the Hydrographic Basins of the Northern Northeast (PISF), in the Municipality of de Custódia, PE (8º7'38.5" S and 37º26"54.3" W, 512 m de alt.). The site was intensely modified for the construction of a 180-meter long canal, about two years ago. The vegetal suppression area of the canal has about 200 m and is mono-dominated by *N. glauca* along its entire extension. The population structure was evaluated through the parcels system. The numbers of fruit per plant and seeds per fruit were also counted, and the propagules' germinability was evaluated. The density estimated for *N. glauca* was 37,280 individuals/ha. The average diameter of the caulis at soil level and the average height of the population were 1.08±1.01 cm and 0.73±0.89 m respectively. The average number of fruit/plant was 2,120.9±939.6, and the average number of seeds/fruit was 643.9±49.9. The germination percentage was 95%. *N. glauca* presented elevated abundance in the study area, much higher than the one found for the autochthon species of Brazilian dry forests. Part of this reproductive success was probably due to the expressive amount of fruit and seeds produced by the species, associated to high germination rates. The ecological characteristics observed for *N. glauca* favour recruiting in intensely degraded areas, which makes other areas in the region susceptible to the invasion of the species.

KEYWORDS: Semi-arid, biological invasion, degradation

FS04.P.10

Structural variations and functional groups composition of the shrub-tree component in palm swamps in southeastern Brazil

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Palm swamps are wetland areas of the Brazilian savannah, a linear phytophysiognomy found along streams and characterized by the palm tree *Mauritia flexuosa*. The objective of this study was to compare the arboreal community structure (richness, abundance, basal area, diversity, and size distribution) and the composition of functional groups in six palm swamps with different human impact. In each site, 100 plots of 100 m^2 were marked, and all arboreal-shrubs individuals with dbh $\geq$ 3 cm were sampled. To determine variations in richness and abundance between the palm swamps as well as between diameter classes, generalized linear models (GLMs). To determine the relationship between plants and the environment, the species were ordinated by canonical correspondence analysis. To determine species preferences by specific area, indicator species analysis was performed. Species richness and abundance differed between sites, and differences in the total basal areas, heights, and diversities were observed. There were significant differences between the diameter classes in the palm swamps. Preserved palm swamps were less associated with the degradation index, whereas the opposite occurred at degraded sites. The disturbances in the study areas also modified the species composition, with different proportions of species and functional groups between sites. In fact, the species showed an association with structure variables and degradation index, and 99 of the 168 species were significant indicators of a given area. The highest proportions of shade-tolerant and light-demanding species were found in less disturbed sites, whereas more pioneering species were found in degraded palm swamps. This study demonstrates that impacts affect arboreal community structure, reducing the species richness, abundance, and diversity of these communities.

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FS04.P.11

How do primates respond to the effects of landscape change in islands formed by a hydroelectric dam?

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Mega-hydroelectric dams are among the key current drivers of habitat loss across Amazonian forests - at least 662,000 ha of pristine forests have been inundated by the nine operational mega-hydroelectric dams in the region to date and 10 additional major dams will be built in this decade. The Balbina Hydroelectric Dam, constructed in 1986 in the Central Brazilian Amazon, inundated 236,000ha of primary forests, and created more than 3,500 variable-sized islands. How has the biodiversity responded to the effects of habitat fragmentation? Focusing our studies on primates, we evaluated how this community responded to the changes in landscape and local structure after 20-year post-isolation history. We based our survey on two methodologies, line-transect and boat-censuses, which were carried out on twenty forest islands ranging from 5 to 1,815 ha. Forest-patch/landscape metrics and five structural components of habitat were measured. A range from 0 to 7 species was recorded on each island. Island area and land cover percentage were the strongest spatial determinants of primate composition, whereas island area alone was the most significant predictor of richness and abundance. Locally, density of trees with DBH>10 cm and the number of vertical stratum were the most significant explanatory variables. Models based on the likelihood approach containing single spatial metrics and habitat structure components showed a positive influence of island size on site occupancy for most species. Patterns of occurrence were considerably different between species. We emphasize the importance of large fragments to protect the remaining primate populations in the Balbina islands, suggesting that conservation efforts should focus on patches larger than 100 ha. Furthermore, we highlight the detrimental consequences of the construction of a hydroelectric dam on primates, and can be used to alert the government and society on the consequences of this human enterprise on biodiversity.

FS04.P.12

Environmental attributes and their influence on the amphibians species composition in an ecotourism area, Bonito, Mato Grosso do Sul State, Brazil

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One of key points in Ecology is to investigate the relationship between organisms and their environments attributes. To analyze the relationship between environmental heterogeneity with the species composition it is an alternative approach to studies that linked environmental attributes to the species richness or diversity. Thus, this study analyze the relationship of the environmental characteristics of wetlands on the composition of frogs species, at Mimosa Farm (20°58'49''S e 56°30'32''W), an ecotourism site at Bonito, Mato Grosso do Sul State, Western Brazil. We sampled 18 wetlands and quantified six environmental attributes, from May 2010 to May 2011. The species composition in each habitat was sampled through the active visual search method and vocalization record. We characterized the change in frog community composition trough a single shaft method produced by a synthetic non-metric multidimensional scaling (NMDS). The environment gradients were represented by the first axis derived from Principal Component Analyses (PCA). Next, the relationship between the two gradients was tested using a simple linear regression analysis. We recorded 24 frog's species, distributed in 11 genera and six families. The number of shrubs and grass height were the variables that best explained the change in composition of frog species. The results of this study indicate that certain environmental variable can be predictors of frog's community composition. This information is useful for the biodiversity conservation in the region, since it may assist in ecotourism, one of the main economic activities in the region.
Support: SBR is CNPq Fellow. JS is CNPq Fellow.

FS04.P.13

The mesoscale distribution patterns of six abundant tree species on Maracá Island, Brazilian Amazonia: are monodominance of Peltogyne characterised by unusual soils?

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The tropics are widely renowned for their spectacular plant diversity. The occurrence of one or a few species dominating large areas of tropical forest was until the mid-*1980's* considered uncommon. An interesting case study is that of *Peltogyne gracilipes* Ducke that forms the only monodominant forest that has been described in the Amazon Basin. Previous studies had suggested that *Peltogyne* forest is related to lower slopes, poor drainage and high soil Mg concentrations. All these studies are based on small scale analyses, with no evidence that this pattern occurs at a mesoscale. To assess whether the monodominance of *Peltogyne* is related to environmental factors we examine the response of the *P. gracilipes,* and other five abundant tree species (*Astrocaryum aculeatum, Attalea maripa, Ecclinusa guianensis, Licania kunthiana* and *Pradosia surinamensis*) on Maracá Island in relation to soil attributes using the standard RAPELD grid system for intensive studies of 25 km^2 square of the Program for Biodiversity Research (PPBio). In the grid there are thirty regularly-spaced plots of 1 ha without a fixed shape, but having a 250 m center line that follows the topographic isoclines. Plot of 20 m x 250 m of the left side of the center line was used for sampling trees ≥ 30 cm DBH (0.5 ha) and plot of 10 m x 250 m (0.25 ha) was used for sampling trees ≥ 10 cm DBH. A CCA (canonical correpondence analysis) was used to analyse the relationship between species abundance and soil variables. Altitude (r= 0.80) and understory height (r= 0.55) were the variables significantly positively correlated with axis I of ordination, while Mg (r= -0.67) and Fe (r= -0.65) were negatively correlated. The soil variables showed a weaker relation with axis II. Canopy height (r= 0.34) and pH (r= 0.30) were the variables that showed the highest correlation coefficients with this axis. Results indicate that there is a sharp relationship between soil traits and the monodominance of *Peltogyne*.

FS04.P.14

Maximized Sampling of Butterflies to Detect Temporal Changes in Tropical Communities

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Butterflies are considered one of the best groups for conservation studies, since they have relatively large size, ease of sampling and a well-known taxonomy. There are few papers describing long-term fluctuations and general patterns of temporal diversity in butterfly assemblages in the Neotropical region. The present paper presents a long-term study on the variation in richness and composition of butterflies in a fragment of semi-deciduous forest in Southeastern Brazil, and examines the viability of using maximized butterfly transect counts as a methodology to rapidly and adequately access the local characteristics of butterfly communities. A total of eight years of data on butterfly species presence was obtained using maximized and standardized sampling, aiming to record as many species as possible, conducted during the peak month for butterflies richness and occurrence in the region. Based on the eight annual standard lists, 518 species in all six families of butterflies were recorded, representing 74 percent of the total butterfly fauna known from the study site. Hesperiidae was the richest family (248 species), followed by Nymphalidae (154), Lycaenidae (49), Riodinidae (29), Pieridae (26), and Papilionidae (12). The accumulation curves show that eight years of sampling were not enough to result in stable species totals for most butterfly families, especially Hesperiidae and Lycaenidae. A great similarity in species composition was observed among all the years (54%). Comparing the similarity between two standard lists at different time intervals (from one to eight years), a clear pattern of increasing dissimilarity was observed in most families. Our results show that the maximized sampling method is effective in revealing temporal patterns of diversity across several years and could be valuable in monitoring temporal variation in butterfly assemblages for conservation purposes, since the obtained standard lists can be successfully compared to temporal patterns over large periods of time.
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FS04.P.15

Abiotic stress reduces the strength of the top-down effects of a terrestrial predator on an aquatic community

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Food webs from aquatic and terrestrial ecosystems can affect each other via resource subsidies or top-down control. In this study we tested the top-down effects of terrestrial predators (spider genus *Psecas*, Salticidae) on the abundance, richness and composition of aquatic invertebrates that live in bromeliad phytotelmata. We also tested whether annual rainfall oscillations affect the strength of this top-down control. We conducted a three-year field experiment in a randomized block design by manipulating the presence of spiders in bromeliads. In addition, we obtained rainfall data set during the experiment. We found that spiders decrease only abundance of cross-ecosystem organisms, i.e., those with complex life cycle (e.g., mosquitoes); there was no effect on organisms with simple life cycle (e.g., Ostracoda). However, the strength of the top down effect was lack with increasing of abiotic stress (i.e., longer gaps with no rainfall); in fact, from 2008 to 2011 the rainfall intensity decreased linearly. It is likely that spiders affect aquatic fauna by preying on terrestrial adults that oviposite in bromeliad phytotelmata. With the increasing in abiotic stress there was a reduction in abundance of aquatic fauna reaching to oviposit and this could have alleviated the negative effects of spiders on cross ecosystem organisms. We showed that although the effect of terrestrial predators can cascade down to aquatic ecosystems, this effect may be buffered by abiotic stress, as global climate change.

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FS04.P.16

Change in life Sclerophylly along successional gradient in a Tropical Dry Forest

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The aim of this study was to compare changes in leaf sclerophylly, as indicated by the specific leaf mass (SLM), along the three consecutive rainy seasons and between successional stages of a Tropical Dry Forest in southeastern Brazil. Sixty leaves from different trees species were collected at the beginning, middle and end of the rainy seasons (2008-2011) in three different stages of succession (early, intermediate and late). After collected, all leaves were photographed on a white background screen with scale in centimeters and then calculated the total leaf area with the software Image J. Leaves were then dried at 70 ° for 72 hours to determination of dry weight. The SLM was calculated using the following index: leaf mass / leaf area (mg/cm2). Leaf sclerophylly did not differ between successional stages during the first rainy season (2008-2009). However, SLM was higher in early successional stages in 2009-2010 and 2010-2011, but no differences were observed between intermediate and late stages. Within-season changes were also observed, and SLM increased significantly throughout the rainy seasons of 2008-2009 and 2009-2010. Successional differences on SLM can be explained by the higher solar radiation received by the whole plants in early stages due to a higher canopy openness. This pattern is opposite to those described for tropical rain forests, which is based in differences in leaf lifespan between pioneer and late tree species. In tropical dry forests, leaf phenology is synchronized with water availability and no successional differences in lifespan are recorded at the community level. Thus, the study of the characteristics of the dynamics of ecological succession in tropical dry forests have a great importance to the regeneration of these areas since the most of these environments are very degraded and have few studies.

FS04.P.17

Local plant species delimitation in a high-diverse Amazonian forest: do we all see the same species?

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Question: How reliable is the process of delimiting plant species by morphotyping sterile specimens from a high-diverse Amazonian forest plot?
Methods: A taxonomic exercise was conducted during a CTFS Taxonomy Workshop (April 2011), based on specimens collected in a 25ha forest plot, located at Central Amazon, Manaus, Brazil. The plant species from this plot had been previously delimited by morphotyping of ca. 80.000 specimens, resulting in the recognition of 115 cases (30% of trees) in which species delimitation was problematic. We selected a subsample of specimens for eight of these difficult cases and then asked 14 participants, with different levels of botanical training, to sort independently these specimens into morphospecies. We compared the classifications made by all participants and explored correlations between botanical training and plant classification.
Results: The classification of specimens into morphospecies was highly variable among participants, except for one study case, for which the median pairwise similarity was 95%. For the other seven study cases, median pairwise similarity values ranged from 52 to 67%. Training did not increase the similarity in the definition of morphospecies except for two study cases, for which there was higher congruence between the classifications made by participants with high-level of botanical training. Number of morphospecies sorted by the participants was highly variable for all study cases, varying from 12 to 46 (383% difference).
Conclusion: Local plant species delimitation by morphotyping sterile specimens is prone to large uncertainties, and botanical training may not reduce them. We argue that uncertainty in species delimitation should be explicitly considered in plant biodiversity inventories as diversity estimates may be strongly affected by such uncertainties. We suggest that species delimitation and identification are treated as separate processes and that difficulties are explicitly recorded, so as to estimate errors and permit the refinement of taxonomic data.

FS04.P.18

Nematode community structure in a tropical forest remnant in Pernambuco, Brazil

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Soil nematode communities (taxa composition, trophic structure, ecological indices) in the remnant of Atlantic Forest were investigated in November 2009 (dry period) and March 2010 (rainy period). Samples were collected at deeps of 0-10, 10-20, 20-30, 30-40, and 40-50 cm along two 200-m transects with points maintained in approximately 20-m intervals from each other. Nematodes were extracted per 300 cm^3 of soil through centrifugal flotation in sucrose being quantified, classified according trophic habit, and identified in level of genus or family. In order to obtain necessary ecological knowledge to the conservation and management of ecosystems some ecological indexes were applied: fungivores to bacterivores ratio (F/B), mean ratio between omnivores + predators and bacterivores + fungivores + plant-feeders (O+P)/(B+F+PF), maturity index (MI), plant parasites index (PPI), Shannon-Weaner's index (H'), trophic diversity (T) and dominance index (Ig). Data were submitted to ANOVA statistical analysis at 5% level of Tukey's test. There was statistical difference between sampling times for the parameters A, PPI, Ig, F/B and O+P/B+F+PF. Community trophic structure presented prevalence of free-living nematodes: omnivores and bacterivores. *Meloidogyne* and *Criconemella* were most common and dominant on rainy period, whereas *Tylodorus* prevailed in dry period, and *Xiphinema* in both periods. This was clearly reflected on the trophic structure of nematode communities, where plant parasites nematodes and omnivores prevailed. The low values of F/B indicated mainly bacterial mediated decomposition of organic matter. The ratio O+P/B+F+PF reflected lower incidence of omnivores and predators in relation to other trophic groups. The high abundance of Dorilaimidae in both sampling moment reflected the low level of disturbance in this area. This fact was confirmed by high values of MI (3.02; 2.99) and PPI (3.15; 3.37) which indicate the a condition. The nematode community parameters were affected by seasonally fluctuating soil conditions, and not vary significantly with deeps.

FS04.P.19

Canopies sap-sucking species richness and distribution along a natural succession gradient of Tropical Montane Forest

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Tropical forest canopy is one of the most diverse terrestrial habitats on earth and among the lesser studied. The effect of natural succession on canopy species distribution is even less known. We tested whether canopy tree species and secondary succession stages affect Hemiptera species richness and abundance in a montane forest within Atlantic rainforest domain, Brazil. The samples were taken in the Itacolomi State Park, during the rainy season of 2011, in three different successional stages. In each area seven to eight canopy segments were sampled (= 4 to 5 continous tree crowns), using a beating sampling device. Successional progress and the number of tree species increased significantly the Hemiptera species richness (ANCOVA's generalized linear model: χ^2 =30.42, p<0.001), and abundance (ANCOVA's generalized linear model: χ^2 =51.78, p<0.001). However, these two factors are partially confounded as the most advanced sucessional stage had a greater number of tree species than the other two stages (χ^2 = 11.04, p=0.003). Our result emphasized then the tree species numbers could be a main causal effect of canopy sap-sucking species richness along the succession. However, sap-sucking species distribution did not differ between natural succession stages, probably reflecting a great tree species similarity between the areas and likely high host specialist among the Hemiptera species (p=0,2; R=0,0752). The study was supported by CAPES/PROF, CNPq and FAPEMIG.

FS04.P.20

Vertical distance from drainage drives floristic composition changes in an Amazonian rainforest

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Plant composition changes with topography and edaphic gradients in Amazonian *terra-firme* rainforests. These correlate with soil-water availability, but data on soil water for the Amazon basin are scarce, restricting opportunities to relate changes in plant composition and soil-water gradients. Therefore, the underlying mechanisms of this relationship and how assemblage composition changes along hydrological gradients are still open questions. In this study, we tested height above the nearest drainage (HAND) as a predictor of floristic composition changes at the mesoscale in a central Amazonian *terra-firme* forest. We examined the patterns of floristic changes along this hydrological gradient of vertical distances from drainage in six plant life-history types: trees, lianas, palms, shrubs, non-fern herbs and ferns. Specifically, we investigated if the patterns of changes in species composition were related to the maximum rooting depth described in the literature. Plant-species composition in 72 plots distributed across 64 km^2 was reduced to one dimension using Non-Metric Multidimensional Scaling (NMDS). NMDS axes were regressed against estimates of HAND in an exponential decay model. The HAND value below which 90% of the changes in species composition occurred was regressed against life-history types maximum root depth. Plant composition changes are highly related to vertical distances from drainage (with up to 80% of the variance explained). All life history types had higher turnover rates close to the saturated zone and few differences in species composition among plots with high vertical distances from water. The patterns of change in species composition showed no relation to maximum root depth. The high correlation between floristic changes and vertical distance from drainage has implications for riparian areas conservation, since brazilian law protects riparian zones according to horizontal distances from drainage. Floristic diversity distribution patterns in Amazonian forests will be strongly affected if ground water regimes are altered by climate change.

FS04.P.21

Community-level response to the exclusion of cattle grazing in a ecotone (tropical/temperate) grassland

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The long term exposure to cattle grazing is a chronic disturbance that prevents the regeneration of many tropical and temperate ecosystems and a driver of habitat deterioration. To what degree the exclusion of this disturbance factor would be enough to allow the regeneration of chronically disturbed grassland areas? The answer to this question is fundamental, since it will determine the need for restoration programs to recover such areas. We carried out an experiment to address the short term response of a grassland area to cattle exclusion, as a first step to study medium-term changes in vegetation composition and structure. We worked in a grassland near Cuernavaca City, in Mexico, in an ecotone between the lowlands covered by tropical dry forests and the Trans-Mexican volcanic belt, where temperate forests dominate. The experimental plot is an area of 97 ha over an elevation gradient from 1700 to 1500 m from the northern to the southern end of the plot. The experiment consisted in three treatments: two different periods of cattle exclusion (24 and 4 months), and no exclusion. These were set both in the northern and the southern end of the plot. At each of these six sites, five 50 x 50 cm quadrats were set in October 2011 within which all the vegetation was harvested. The species were identified and their abundance measured as dry biomass per quadrat. We found 83 species, mostly herbs and grasses, and a few shrubs. Poaceae, Fabaceae, Asteraceae and Cyperaceae were the most abundant plant families. The effect of grazing exclusion treatments on species richness was significant, but not the effect of zone (north *vs*. south). Species richness was highest in the 4 mo exclusion. Diversity and equitability decreased, and dominance increased in the 24 mo exclusion. Total biomass increased with time since exclusion.

FS04.P.22

Disentangling the role of edaphic variability, flooding regimes and topography of an Amazonian white-sand forest

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Many studies have demonstrated the importance of environmental factors in controlling the distribution of plant species at different spatial scales in *terra firme* Amazonian forests, but the magnitude of the effects of these factors on the variation of species composition in seasonally flooded white-sand vegetation still remains poorly determined. Data from 17, 1-ha permanent plots distributed across a 25 km^2 landscape within the Viruá National Park, Northern Amazonia, was used to assess the soil, flooding and slope effects on tree species composition, diversity and structure. Our analyses were based on 16,599 trees (dbh $\geq$ 1 cm) belonging to 315 species. Soil texture and fertility were the most important predictors of the variation in tree composition, diversity and structure for the three different size classes analyzed (dbh $\geq$ 1 cm, 1 cm $\leq$ dbh < 9,9 cm, and dbh $\geq$ 10 cm). Overall, plots on more fertile clayey soils showed greater tree diversity and basal area than those on well-drained sandy soils. Although flooding had low effects on the tree community, the water level was higher in high-statured forests established on more clayey and fertile soils. Therefore, even though soils in the study area are predominantly sandy and oligotrophic, our findings highlighted the importance of soil in structuring tree communities of seasonally flooded forests at mesoscales in the Amazon Basin.

FS04.P.23

Influence of seasonal variations in soil water availability on gas exchange of tropical canopy trees

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Seasonal variations in environmental conditions influence the functioning of the whole ecosystem of tropical rainforests, but as yet little is known about how such variations directly influence the leaf gas exchange and transpiration of individual canopy tree species. We examined the influence of seasonal variations in relative extractable water in the upper soil layers on predawn leaf water potential, saturated net photosynthesis, leaf dark respiration, stomatal conductance and tree transpiration of thirteen tropical rainforest canopy trees (8 species) over two years in French Guiana. The canopies were accessed by climbing ropes attached to the trees and to a tower. Our results indicate that a small proportion of the studied trees were unaffected by soil water depletion during seasonal dry periods, probably thanks to efficient deep root systems. The trees showing decreased tree water status (*i.e.* predawn leaf water potential) displayed a wide range of leaf gas exchange responses. Some trees strongly regulated photosynthesis and transpiration when relative extractable water decreased drastically. In contrast, other trees showed little variation, thus indicating good adaptation to soil drought conditions. These results have important applications to modelling approaches: indeed, precise evaluation and grouping of these response patterns are required before any tree-based functional models can efficiently describe the response of tropical rainforest ecosystems to future changes in environmental conditions.

FS04.P.24

How do understory herbs respond to the water conditions in Amazonian forests and how this can affect their conservation in a climate change scenario?

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Although it is known that water conditions are important determinants of species composition in tropical forests, the relationship between hydrology and vegetation is often accessed indirectly through proxies, such as topography. We investigated the relationship between understory herb distribution and the local and regional hydrological conditions on eighty-eight 250 x 2 m plots distributed over an area of approximately 600 km troughout Central Amazonia, crossing the interfluve between Purus and Madeira rivers. Local water conditions were represented by the Height Above the Nearest Drainage (HAND, which is related to the water table depth) and the water level above the ground during floods. The local water condition was a better predictor of species composition than the regional climatic conditions given by precipitation. Soil fertility was a less important predictor than local hydrological conditions for terra-firme plots. Within the herb community, Zingiberales was the group with the strongest association with water conditions, while Poaceae and Pteridophyta only distinguish flooded from not flooded environments, but do not have fine scale patterns within terra-firme. Herb composition is affected by water conditions and therefore should change in response to climate changes. The predictor of local water conditions (HAND) can be derived to large scales using remote sensing tools, and can thus be used to evaluate the present plant distributions and their potential changes in climate change scenarios. The application of our model for herb composition as predicted by the water conditions to the Purus-Madeira interfluve has shown that most of the herb community is already included in the conservation units of this region. However, a strategy to provide refuges for plant migration should include the conservation of the wettest area in the region, nowadays not preserved.

FS04.P.25

Water-table level limits the stocks of aboveground biomass in the Purus-Madeira interfluve

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Aboveground biomass (AGB) varies of across Amazon basin and this spatial variation is important for estimations of carbon losses from land-cover changes and tropical drought impacts. The Purus-Madeira interfluve is a poorly known region with environmental characteristics that might affect forest structure and AGB stocks, such as poor soil drainage and shallow water-table. In this study we investigated the direct influence of water-table fluctuation on forest structure, wood density (WD) and AGB over a 600 km transect along the Purus-Madeira interfluve, in central Amazonia. We measured tree diameter at breast height (dbh) of individuals with dbh ≥ 10 cm in 35 1-ha plots and calculated the total basal area (BA)/ha. Twenty randomly selected trees (dbh ≥ 30 cm) in each plot had the height estimated and a wood sample collected from the trunk for WD analyses (oven dry-weight/fresh volume). Average values of tree height and WD were calculated for all plots. AGB stocks were estimated using an allometric equation based on individual dbh and mean plot WD. Water-table level was measured in all plots in March (rain season), July (dry season) and November (late dry season) of 2011. Forest structure variables, WD and AGB were regressed against water-table level at the three moments of the year. Tree height and BA were negatively correlated with the water table level at the rainy season and WD showed no correlation with the water-table level. AGB had 36% of the variance explained by the water-table level at the rainy season and lower stocks were found where the water-table was closer the ground surface (within the first 50 cm). Anoxic conditions, during rainy season, might be affecting forest structure and limiting AGB stocks along the Purus-Madeira interfluve. Events of extreme droughts should lower the water-table level and positively affect forest biomass in this region.

FS04.P.26

CO2 enrichment influences the spectral signature, development and endophyte community in a tropical wild shrub

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Globally increasing atmospheric CO_2 concentration affects many aspects of plant structure and physiology. Such shifts may have consequences for plant-endophyte interactions and ecosystem structure and function. The present study analysed the effects of enriched CO_2 on development, structure (from spectral changes) and endophyte diversity on a native plant species from the cerrado (Brazilian savanna), *Baccharis dracunculifolia* (Asteraceae). Our results indicate that plants under CO_2 enrichment presented a substantial increase in plant growth and biomass. The most pronounced effect was an increase in root biomass (321%). However, the content of macro and micronutrients decreased with the elevation of CO_2 concentration. Leaf reflectance varied between CO_2 treatments, especially in the near-infrared spectrum. The values of spectral vegetation indices such as NDVI, SR, mND and mSR found in the CO_2 enrichment treatment were reduced by 1%, 5%, 8%, and 8.5%, respectively compared with the control CO_2 treatment. The similarity of the endophyte species presented between each treatment was 48%. Our results suggest that enriched CO_2 promotes significant alterations in plant structure and development, and even with the plant´s relationship with its associated endophytes. Knowledge about these effects on native plants may help in understanding the complex changes on tropical ecosystem in a future enriched CO_2 world.

FS04.P.27

Controls on foliar nutrient resorption of nine canopy tree species of a secondary wet tropical forest in Costa Rica

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Withdrawal of nutrients at the time of leaf abscission (nutrient resorption) is a nutrient conserving mechanism that plays an important role in determining the nutrient economy of forests. While the influence of environmental gradients on this process has been well documented, we have little understanding of what drives variability among individuals within a single forest stand, especially tropical forests. We evaluated inter- and intra-specific variation in foliar nutrients, nutrient resorption, physical leaf traits, and soil nutrient availability of nine canopy tree species within a 1-ha secondary wet tropical forest in northeastern Costa Rica. We hypothesized that inter-specific variation in nutrient resorption efficiency (RE) would be driven by differences in physical leaf traits. We further expected seasonal variability in precipitation would drive temporal variability in nutrient RE. As expected, physical leaf traits exerted a strong influence on nutrient RE of co-occurring species. Intra-specific variability in both nitrogen and phosphorus RE was significantly negatively related to leaf specific strength. Contrary to expectations, phosphorus RE was higher in the wet season for four of the nine canopy tree species, while nitrogen RE did not differ seasonally. Low dry season phosphorus RE may be due to incomplete nutrient resorption during periods of low rainfall. Nitrogen and phosphorus RE varied significantly over the short-term (bi-weekly) with phosphorus and nitrogen RE increasing in both *Pentaclethra macroloba* and *Laetia procera* as the wet season progressed. This variability was not related to rainfall, temperature, or soil phosphorus availability. Instead, the senesced leaf nutrient concentrations were a simple proportion of green leaf nutrient concentrations, with short punctuated periods of high RE that may be reflective of species-specific phenological events, such as fruit and leaf production. The different timing of the seasonal increase in nutrient resorption between *L. procera* and *P. macroloba,* supports this hypothesis.

FS04.P.28

FLORISTIC COMPOSITION AND STRUCTURE OF THE VASCULAR EPIPHYTE COMMUNITY IN A SWAMP FOREST IN SOUTHEASTERN BRAZIL

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Due to the low amount of information about the vascular epiphytes communities in interior of São Paulo State southeastern Brazil the aim of this work was to describe the floristic composition and the phytosociological structure of vascular epiphytes in a semideciduous riverine forest with permanent fluvial influence (swamp forest). The survey was conducted in a 2.3 ha of swamp forest located at the Legal Reserve of São Paulo State University (UNESP) Campus of Bauru. During March through August 2011 we analyzed 464 phorophytes with stem perimeter at breast height 30 cm distributed in 20 plots of 10 m x 10 m. The phorophytes were divided in three strata to analyze vertical distribution of epiphytes. We sampled 1130 epiphytic individuals of 11 species belonging to three families. The families with highest species richness were Bromeliaceae (6 spp), Orchidaceae (3 spp) and Polypodiaceae (2 spp). All species were classified as true holoepiphytes. Considering the value of epiphytic importance, the most important species was *Tillandsia tenuifolia* L., mainly due to its high abundance (64% of the individuals). The crown presented the highest abundance (648 individuals) followed by high bole (443 individuals) and low bole (39 individuals). The species *Trichocentrum pumilum* (Lindl.) M.W.Chase & N.H.Williams was found only in the high bole. The greater abundance of epiphytes in the upper strata where there is a higher light incidence might be an indication that there is no limitation of atmospheric moisture in the canopy in the ecosystem studied. (CNPq processo n^{0} 130903/2011-6)

FS04.P.29

Floristic composition of different under-sampled sites in the State of Amazonas

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There is a positive relationship between plant diversity and sample collection efforts in the tropics. In the Brazilian Amazon, for instance, Manaus and Belém have presented the highest plant diversity, so far. This work deals with the data set of the project entitled "Carbon Dynamics of Amazonian Forests – CADAF", which has been carried out under the agreement between INPA (National Institute for Research in the Amazon) and JICA (Japan International Cooperation Agency). CADAF forest inventories have covered seven different under-sampled sites in the State of Amazonas involving 720 sample plots (20 by 125 m each; DBH ≥ 10 cm). Floristic composition at genus level was performed for each site. The number of botanical families and genera of tree species varied significantly between sites; from 48 to 53 different families, and from 139 to 160 genera. A cluster diagram of the seven sites based on genus and the quantitative Jaccard similarity index plots were grouped by geographical distance. Sites not very far from each other, Atalaia and Jutai, presented a similar floristic composition, which were mainly represented by *Eschweilera*, *Protium*, *Virola* and *Iryanthera*. On the other hand, São Gabriel, which is the most remote site, the variation was very little within site, but it was highly significant between sites. In São Gabriel, the dominant genera were *Micrandra* and *Swartzia*. In terms of number of individuals in all seven sites, the most important families are: Lecythidaceae, Fabaceae, Combretaceae and Lauraceae. This data set can help the improvement of plant distribution mapping, as well as the identification of endemism regions. It is extremely important that management plans of Amazonian conservation units, either for conservation or resource use, take into account biogeographic differences in terms of species composition.

FS04.P.30

FLORISTIC COMPOSITION OF FORESTS COMMUNITIES IN BAURU, SÃO PAULO STATE, SOUTHEASTERN BRAZIL

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In Bauru, middle-west São Paulo State, southeastern Brazil, woodland savanna, seasonal semideciduous forest and swamp forest form a vegetation mosaic in an area of approximately 942 ha which has been considered priority for conservation. Due to the necessity of providing subsidies to set strategies for management and conservation, the aim of this study was to describe the floristic composition of these forests communities. The study area comprises three continuous fragments the Legal Reserve of São Paulo State University (UNESP) Campus of Bauru, the Reserve of Bauru Botanical Garden and the Ecological Reserve of the Beneficent Society Dr. Enéas Carvalho de Aguiar. A survey of all data on flora biodiversity carried out in those fragments and available in literature was conducted as well as a review of 1125 exsiccates from the herbariums of the UNESP Campus of Bauru (UNBA) and Bauru Botanical Garden (JBMB). The floristic composition shows 537 species belonging to 100 families. The families with highest species richness were Fabaceae (54 spp), Asteraceae, Myrtaceae, Rubiaceae (28 spp each), Bignoniaceae and Malpighiaceae (22 spp each). The Venn diagram built based on the presence and absence of species in three vegetation formations indicated that 217 species were only found in woodland savanna, 76 in seasonal semideciduous forest and 92 in swamp forest. Woodland savanna shared 105 species with seasonal semideciduous forest and 19 species with swamp forest. Seasonal semideciduous forest shared 13 species with swamp forest. Only 15 species were found in all vegetation formations: *Ardisia ambigua*, *Cecropia pachystachya*, *Pera glabrata*, *Syagrus romanzoffiana*, *Tapirira guianensis* (trees); *Dendropanax cuneatus*, *Erythroxylum subracemosum*, *Miconia chamissois*, *Psychotria carthagenensis*, *Siparuna guianensis* (small trees or shrubs); *Adiantum serratodentatum*, *Serpocaulon vacillans* (herbs); *Pleopeltis pleopeltifolia*, *Pleopeltis polypodioides* and *Tillandsia usneoides* (epiphytes). The floristic richness of this vegetation mosaic confirms the high biological value for its conservation.

FS04.P.31

Floristic composition of Andean forests in Cueva de Los Guacharos National Park (Colombia): Resilience and environmental gradients

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The negative effect of anthropogenic disturbance on tropical forest may be attenuated when processes of secondary succession rapidly restore forest structure and composition. In this study we evaluated how forest composition is associated with human use history and abiotic factors (i.e. geomorphology, temperature and soil traits) in Cueva de los Guacharos National Park (Colombia). We built 20 polts (0.1 ha) in three forest types (sub-Andean forests on ridges and middle slopes -including secondary forests- and Andean forests). Floristic composition varied with altitude, being white oaks (*Quercus humboldtii*, Fagaceae) the dominant tree in Andean forests. In spite of structural similarities, after 50 yr of succession, secondary forest showed different species composition than primary forests. *Saurauria brachybotris* (Actinidaceae) and *Nectandra cf. obtusata* (Lauraceae) were the dominant trees in secondary forests, while *Wettinia kalbreyerii* (Arecaceae) and *Hieronyma cf. huilensis* (Phyllanthaceae) were the most important in primary forests. Topographic steepness showed a minor effect on floristic composition. The major part of the variation in floristic composition was explained by soil variables (ca. 23%), while geographic distance explained only 13%. However, the low diversity sub-Andean black oak forests (*Trigonobalanus excelsa*) were not associated with abiotic factors, suggesting that their occurrence may depend on biotic ones (cf. allelopathy). We conclude that in our study system the process of secondary succession may take too long to preserve tree regional diversity and then primary forest protection seems imperative.

FS04.P.32

Influence of historical and environmental factors on primate beta diversity in the Negro river basin, Northern Brazilian Amazonia.

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Primate distribution in the Neotropics is highly influenced by the different vegetation types, with their high heterogeneity and peculiarities. This, therefore, determines the persistence and movements of the species within and between habitat mosaics, mainly as a way to fulfil their nutritional demands. In this study we aimed at evaluating how environmental factors affected the primate diversity and biomass in five different sites in the Negro river basin and its conservation implications. These sites were located in the Negro river basin and comprised mainly terra firme forests, campinas and campinaranas, all typical of much of the region. These sites had from one to three transects, ranging from 4 to 10 km in length, along which we carried out line transect surveys, from which we got diversity and equitability indices, as well as biomass (kg/km^2). We also analysed satellite images Landsat TM5, following the standard procedures of register, cutting and modelling and got indices of vegetation, environment water, leaf area, and surface temperature, which were correlated as well as analysed through MDS. Our results suggested that areas with higher vegetation indices presented higher diversity and lower biomass, whereas areas with lower vegetation indices presented higher primate biomass and lower diversity. This has serious implications for the design of parks and reserves in the Negro river basin, especially in the face of climate changes, since in order to encompass enough terra firme forests to safeguard long-term adequate primate diversity and abundance it is necessary to create comparatively larger protected areas.

FS04.P.33

ECOLOGICAL ASPECTS, DIVERSITY AND DISTRIBUTION OF SNAKES IN BIOTOPE PRESERVED AND ANTHROPOGENIC JAMARI NATIONAL FOREST - RONDÔNIA - WESTERN AMAZON/BRAZIL

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This study investigated and analyzed the faunal composition of snakes in some preserved biotopes and anthropogenic from Jamari National Forest (Floresta Nacional do Jamari) in Rondônia. Ecological aspects were listed in order to obtain information about the faunal composition of snakes of the sampled areas and its diversity. Potential points of occurrence of snakes were sampled as well as their relation to the seasonality and their natural environments, in view of in Amazon, Amazonian summer and winter are well defined seasons. It was found several species, such *Corallus hortulanus, Epicrates cenchria, Xenopholis scalaris, Bothriopsis taeniata, Micrurus spixii, Liotyphlops sp.* e *Dipsas catesbyi.* Most snakes were found during visual search limited by the time at night, there was also the relationship between the rainy season with the seaching of snakes. During this work, some aspects related to the use of food, foraging and habitat of the snakes of the region of the Jamari National Forest were observed, it was also observed that there were important factors that may be linked to the presence or absence of snakes in certain preserved and anthropogenic environments. Multivariate analysis demonstrated the formation of distinct groups characteristic of preserved and anthropogenic biotopes (Environmental Gradient) throughout the classification and ordering methods, that showed consistent, it was confirmed the existence of patterns on the snake community.

FS04.P.34

Richness, composition and abundance of insects associated with the crown of *Mabea Fistulifera* (Mart.) and *Byrsonima sericea* (D.C)

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In this work, was studied the richness, abundance and composition of insect species and associated species *Mabea fistulifera* (Euphorbiceae) and *Byrsonima sericea* (Malpiguiaceae) in the Parque Estadual do Rio Doce (PERD), Southern Eastern Brazil. *Mabea fistulifera* is a pioneer species present in late secondary forest (45 years) and anthropomorphic edges, while *B. sericea* is persistent and adapted to natural ecotones, especially in aquatic environments. In common, both species are a predominant portion of the biomass of the canopies of the habitats where they occur. Samples of insects was conducted in February 2011, using the technique of beating in branches and leaves with the aid of entomological umbrella in four areas of the PERD. We studied 15 trees in each of four areas, including: forest edges with pasture, with the road edge; secondary forest ecotone late and with a natural lake. Sampled a total of 291 adult insects were divided into 26 families belonging to 73 morphospecies. . For canopy of *M. fistulifera* were found on average 2.64 species and 4.89 individuals, have a cup *B. sericea* species were found 3.67 and 4.67 individuals. *Bysrsonima sericea* was the most dominant species in the ecotone, while *M. fistulifera* is the most common in the other three habitats. So much for wealth and abundance, were observed values significantly greater for older and preserved habitats (late secondary forest and natural ecotone) compared with anthropomorphic edges (ANOVA, $p < 0.05$). Moreover, both species were fauna distinct, with the overlap of only five species of Coleoptera. Incidentally, these are the most abundant throughout the collection, suggesting that generalists are common throughout the park. The different plant species accumulate a distinctive fauna, indicating that mean diversity per crown is severely affected by the vulnerability of the habitat. The study was supported by Capes/PROF, CNPq and Fapemig.

FS04.P.35

Turnover of beetle assemblages in relation to seasonality in a tropical forest

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Seasonal dynamics of tropical insects is one of the less explored areas within the study of their ecology. The seasonal influence of precipitation on beetle assemblages was studied in tropical lowland forests in Panama. A sharp variation in precipitation occurs in the area throughout the year, with a marked dry season between January and mid-April. Beetles were collected from 12 sites using flight intercept traps between May 2007 and May 2008. Beetles were identified to family level, classified into five feeding guilds, and two focal families (Curculionidae and Histeridae) were identified to species level. Sixty-three families of beetles were identified from 19,981 individuals collected. For Curculionidae, 201 species were identified from 851 individuals and 74 species of Histeridae were identified from 1,549 individuals. The highest abundance and species richness of beetles were found early in the wet season, with a high turnover (beta diversity) between the early wet and the late wet seasons. All feeding guilds had a higher relative abundance early in the wet season with the greatest difference between the early and late wet seasons. Mantel tests of correlations of beta diversity between all beetles and the precipitation at each sampling period show a significant positive correlation, showing that turnover of beetle assemblages is significantly influenced by the amount of precipitation. High beta diversity throughout the seasons might be related to different resources available and different assemblages of beetles exploiting those resources.

FS04.P.36

Effect of disturbance frequency on aquatic macroinvertebrates composition in a neotropical stream.

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Natural disturbance in streams, mainly in moutain regions, plays an important ecological role in this ecossistems. Understanding the communities dynamics of these environments can aid in their management and conservation. In this respect, the aim of this work was to analyse the effects of physical disturbance on the abundance, richness and faunistic composition of macroinvertebrates in Ribeirão Lajeado, Parque Estadual Intervales, situated in Paranapiacaba Mountains, São Paulo State, southeastern Brazil. The experiment lasted 30 days, in this period areas (plots) were delimited, and experimental disturbance were handling with different frequency (intervals of 5, 15 and 30 days), intensities (high and low) and area (0,5m x 0,5m and 2,0m x 2,0m). After the experimental period, a Surber sample was used to collect macroinvertebrates from the center of each plot. Disturbance frequency, intensity and area did not affected the abundance and richness, contradicting our initial hypotheses. On the other hand, disturbance frequency affected the faunistic composition (PERMANOVA, p=0,0158), more specifically between the frequencies of 5 and 30 days (*a posteriori* test PERMANOVA, p=0,0022). Based on this result, it was possible to identify taxa indicators for frequency disturbance of 30 days. Our results suggest that some taxa are slower colonizers; therefore they require that substrates remains stable in a time enough to their adequate establishment.

Keywords: Aquatic insects; macroinvertebrates colonization; lotic habitats.

FS04.P.37

The environmental integrity and stream size affect the diversity and abundance of Trichoptera (Insecta) in mountain streams

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Abstract. The fauna of Trichoptera in rock substrate was collected in 22 streams (1st to 4th orders) from "Serra do Mar", State of São Paulo, in order to test the following predictions: 1) the richness increases with stream size (discharge), environmental integrity and vegetation cover; 2) the abundance decreases with vegetation cover and increases with stream size and conductivity; 3) alpha diversity is lower and beta diversity is higher in smaller streams; 4) the decreasing of environmental integrity reduces the alpha and beta diversity; 5) geographically closer streams, with similar environmental integrity, size (discharge) and vegetation cover present similar faunistic composition. During this study, we collected 7312 larvae of Trichoptera, distributed in 12 families and 27 genera. The estimated richness for the region, by Jacknife 2 estimator, was 39 genera. Vegetation cover, altitude, geographical distance and status of antropic action had a significant relationship with composition of Trichoptera (Mantel Test), however, these relationships had low intensities. Multiple linear regression showed that stream size (discharge) was positively related with richness and abundance. The abundance of the genus *Helicopsyche* was positively related to stream size and negatively related to environmental integrity and vegetation cover. The abundance of the genus *Grumichella* was positively related to stream size and environmental integrity. The streams with intermediate discharge had lowest beta diversity. On the other hand, the beta diversity did not differ among streams with different environmental integrity.

Keywords: Trichoptera, vegetation cover, altitude, geographic coordinates, anthropic action, diversity.

FS04.P.38

Recruitment limitation in a Mexican secondary dry tropical forest

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Recruitment limitation may be due to low seed rain and/or low germination and seedling establishment. To evaluate recruitment limitation in a secondary dry forest in central Mexico following 30 years of disturbance, seed fall of woody species was evaluated monthly in 96 0.75 m^2 seed traps and recruitment in 96 1 m^2 quadrants during four years in 8 50 X 50 m exclosures established in January 2006. The most important species in the seed rain were the pioneer bird-dispersed shrub *Hamelia patens* (Rubiaceae) and the pioneer dispersed by wind *Heliocarpus pallidus* (Tiliaceae). The species with the highest density in the community of recruits were two pioneers dispersed by gravity, *Mimosa benthami* (Fabaceae) and *Acacia cochliacantha* (Fabaceae). Composition of non-pioneer species dispersed by animals in the seed rain was gradually shifting towards whereas recruitment was still dominated by pioneers species dispersed by wind after four years. For the 13 species shared in the seed rain and the community of recruits, no correlation was found regarding density of individuals. Most species present in the seed rain did not recruit individuals or had very low recruitment. *H. patens* had the highest abundance of seeds but zero recruitment whereas *H. pallidus*, the second in abundance, recruited only 17 individuals. The number of seeds required to recruit one individual varied by orders of magnitude, from *M. benthami* which required 22 seeds to produce a seedling to *H. pallidus* which required > 3510 seeds. In average, pioneers (732.80 ± 560.35) required more seeds to produce a seedling than non-pioneers (374.16 ± 174.09) but differences were not statistically significant. Non-pioneer species that require a low number of seeds to recruit an individual as *Bursera grandifolia* (51 seeds), or *Ceiba parvifolia* (56 seeds), may be introduced to erly successional environments by direct seeding to accelerate succession.

FS04.P.39

Factors Affecting The Structure Of Coleoptera Assemblages On Basidiomes Of Polyporales And Hymenochaetales (Fungi: Basidiomycota).

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Fungivory is one of the most primitive feeding habits among beetles. However, unlike herbivory, little is known about the organization of fungivore assemblages. Studies of plant-insect interactions have shown that the chemical composition and the physical structure of the host can influence its selection by beetles. Likewise, it is expected that, the consumption of the reproductive structures of the fungi (basidiomes) by beetles may also be affected by same factors. In this study, we accessed the assemblages of fungivorous beetles on 40 species of fungi to investigate their feeding specificity and the effects of host fungi taxonomical distance, basidiome consistency and hyphal system on the stucture of beetle assemblages. We collected 376 basidiomes from the orders Polyporales and Hymenochaetales in an *Araucaria* forest in the south of Brazil. Basidiomes were maintained in the laboratory individually in plastic containers for up to three months to allow the beetles to develop until adulthood. We found that 55% of fungi individuals had associations with 90 morphospecies of Coleoptera. Beetle richness, estimated in 12 different fungi species, ranged from 4 to 8 in different hosts. However, there was no significant difference in beetle richness associated to coriaceous or wody basidiomes (Wilcoxon Rank-Sum test, $p = 0.47$). Most common species of Coleoptera (found in more than 5 fungi individuals) were mainly oligophagous or polyphagous (only 2 species were monophagous). Their feeding specificity was not related to the longevity (annual or perennial) of basiomes (Chi square test, $p = 0,96$). More closely related fungi (taxonomically) hosted more similar assemblages of Coleoptera. Fungi toughness, represented by different consistency classes, and the structure of the hyphal system were also important factors for beetle host selection. These results support the importance of structural characteristics of basidiomes in determining insect-fungus interactions.

FS04.P.40

Powerful distance-dependent effects for a spatially aggregated tropical species

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A fundamental aspect of the Janzen-Connell Hypothesis (JCH) is that distance- and density-dependent mortality reduce the local dominance of species and cause regular rather than random or aggregated spatial patterns. Despite this explicit linkage between process and pattern, very few studies have explored how JCH processes translate into the spatial distributions of adult populations. In field experiments, we assessed germination, mortality and growth of conspecific and heterospecific seedlings close and far away from *Esenbeckia leiocarpa*, a highly aggregated tropical tree species. We also investigated the effects of vertebrates using exclosures in the field, and the effects of pathogens in a soil sterilization shadehouse experiment. Germination of conspecifics underneath *Esenbeckia* was reduced by 64% and mortality increased 28-123% when compared to seedlings growing under other tree species; 99-100% of *Esenbeckia* seedlings died under conspecifics. Heterospecifics were much less affected by *Esenbeckia* canopies. We found no evidence that either vertebrate herbivores or soil pathogens affected seed germination and seedling performance. Our study demonstrate strong negative distance-dependence for an aggregated tropical tree species, thus suggesting a much broader role for Janzen-Connell processes as determinants of the distribution and abundance of tree species in tropical forests. We also found powerful negative effects of conspecifics on germination, a largely overlooked aspect of the JCH.

FS04.P.41

Is β-diversity higher at forest edges? A study of dung beetles in the Brazilian Amazon

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Forest communities that border an anthropogenic matrix will be affected by a suite of biotic and abiotic effects different from those of the forest interior. With the creation of an estimated 70,000km of new forest edge per year in the Amazon it is clear we need a good understanding of the effects, and how deep these effects penetrate in to the forest. The spatial component of diversity, β-diversity, may compose a significant component of overall γ-diversity, often much greater than local α-diversity. Given the importance of β-diversity to generating and maintaining patterns of diversity we have little understanding about how it may be affected by proximity to edges.

We investigated the spatial turnover of dung beetles at the forest edge compared to the forest interior at Jari, Pará, Brazil. Using a novel sampling design explicitly created to investigate β-diversity based upon a fractal pattern of equilateral triangles across four spatial scales we sampled at two edge types: primary-secondary forest and primary forest-*Eucalyptus* edge, along with a control in each of the three habitats.

By sampling at four distances (10^0, 10^2, $10^{2.5}$ and 10^3m) from the edge into both the forest and the matrix interior we were able to estimate the slope of dissimilarity-distance decay from 0-1000m from the border. Slopes were significantly greater at the border between primary and secondary forest, and greater, although insignificantly so, at the younger border between primary forest and *Eucalyptus*. The results provide further evidence for hyperdynamism in ecological and abiotic processes at forest edges.

FS04.P.42

Forest metacommunity structure along an elevational gradient in the Luquillo Mountains, Puerto Rico

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Metacommunity theory provides a rich framework for identifying structure along environmental gradients and for evaluating the relative contributions of local and regional processes in molding biological communities. We used a novel suite of analyses to comprehensively evaluate metacommunity structure of forests sampled along two elevational transects (0.1 ha plots at 50 m intervals from ~300 to ~ 1000 m.a.s.l) in the Luquillo Mountains (LM) of Puerto Rico. We quantified three elements of metacommunity structure (coherence, species range turnover, and range boundary clumping); for transects with significantly clumped boundaries, we used the multiplicative model for partitioning diversity to determine the number of compartments (i.e., a group of sites with similar species composition that is distinct from other such groups of sites) in each transect; used cluster analysis to determine the location and extent of compartments in each transect; and identified species that were key indicators of each compartment. Each transect exhibited Clementsian structure with the analyses identifying three or four distinct species compartments along the elevational gradient. Despite the difference in the number of compartments, the elevation of many compartment boundaries were highly consistent between transects. A total of 47 species (40%) were significant indicators of particular compartments for at least one transect; however, the identities of indicator species were not highly consistent between them. High elevation compartments characteristically contained many endemics to the LM or to the island of Puerto Rico, with significant implications for the relative importance of historical processes in molding metacommunity structure. Sampled transects in the LM differed in species richness and composition, identity of indicator species, history of disturbance, aspect, wind exposure, number of endemic species, and elevational extent. Nonetheless, their metacommunity structures were quite similar, suggesting that mechanisms affecting the structure of montane vegetation may be resilient to variation in natural processes as well as to anthropogenic disturbances.

FS04.P.43

Controls on the carbon balance of African tropical forest

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African closed-canopy tropical forests are in some respects the least understood of the world‘s major rainforest blocks. Here we utilise the AfriTRON network (African Tropical Observation Network, www.afritron.org), a group 140 long-term phytodemographic plots widely distributed across West, Central and East Africa (~100,000 trees > 100mm diameter), to estimate forest biomass and carbon stocks, and assess the controls on these in parameters in terms of climate, disturbance (natural and anthropogenic) and soil characteristics alongside the internal dynamics of the forests themselves. Critical questions include: why do tropical forests in Africa store much more carbon per hectare than many Amazonian forests? The results will help us better understand these remote forests, particularly in the context of the debates around REDD+ (Reducing Emissions from Deforestation and forest Degradation), and the impact of global environmental changes, notably air temperature increases.

FS04.P.44

Abiotic drivers change during 18 years of landslide succession in Puerto Rico

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Predicting patterns of plant succession on tropical landslides is challenging because of their spatial heterogeneity, distinct abiotic gradients, and initial lack of biota. We used structural equation models to interpret the influences of landslide dimensions, drainage area, slope, aspect, elevation, parent material and related soil properties on characteristics of the major plant colonizers (seed plant density and diversity, tree fern density, and scrambling fern cover) and soil development (nitrogen concentration, percent organic matter, pH, and cation exchange capacity). The influence of abiotic variables on plant succession changed with time and differed among plant groups. The density of seed plants was mainly influenced by drainage area at 7 years (higher density and diversity on larger drainage areas) and by slope and soil K concentrations at 18 years (fewer plants on steep slopes and in soils with high soil K). The density of tree ferns and the cover of scrambling ferns were highest on slopes exposed to hurricane winds at 7 years but scrambling fern cover was lowest on the exposed slopes at 18 years. Soils were least developed on steep slopes and most developed on hurricane-exposed slopes and where there were high soil K concentrations. Improved predictability of temporal dynamics will rely not only on understanding the effects of initial disturbances and subsequent biological response, but on the ongoing and changing influence of abiotic drivers.

FS04.P.45

Soil physical constraints as a limiting factor of palm and tree basal area in Amazonian forests

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Trees and palms adopt different root strategies and show varying responses to physical limitations imposed by soil structure, depth and anoxia. Here, we analyse the relationship between soil physical constraints and basal area in order to better understand how the physical limitations of soil influence the structure and physiognomy of lowland Amazonian forests. We analysed inventory data from 77 widely-distributed forest plots in the RAINFOR and PPBio Amazonian networks for which basal area and soil data were available, using ordinary and quantile regression models. Soil physical properties played an important role in establishing the upper boundary for basal area of trees and palms. Soil physical constraints alone explained up to 24% of palm basal area and, together with rainfall, up to 18% of tree basal area. Tree basal area was higher in well-drained, well-structured and deeper soils, while palm basal area was higher in poorly drained, less structured and shallow soils. Our results show that soil physical conditions can differentially affect basal area contribution of palms and trees directly or indirectly. We suggest that adaptations intrinsic to these life forms drive their responses to soil structure and forest disturbance, thus shaping the forest physiognomy.

FS04.P.46

Habitat Specialization in a Hyper-diverse Amazonian Forest

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To explain the coexistence of extreme numbers of tree species in a small portion of tropical forest remains an important challenge for ecologists. Studies in tropical large permanent plots have shown a high degree of habitat association at local scales and this pattern is often interpreted as evidence of niche partitioning. In addition, stochastic processes such as dispersal limitation have been advanced as important for coexistence of more equivalent species. Since these processes are not mutually exclusive and could act in conjunction to stabilize coexistence, they could produce a pattern of greater variance in niche-overlap between pairs of species. We present the results from a large (25 ha) hyper-diverse permanent plot in central Amazonia. We investigated tree species habitat associations using a conditional probability kernel-based nonparametric density estimation for each species and niche-overlap calculated as the superposition of the normalized curves between pairs of species. We used a spatial stationary null model that preserved point density of species distributions, as well as habitat spatial auto-correlation to investigate the relative importance of specialization and equivalence of species. A large proportion of species shows some degree of habitat association and the mean habitat overlap is lower than expected by the null model. At the same time, the proportion of maximum variance observed is higher than the pseudo-values generated by the null model. Since the null model preserved the species aggregation pattern mainly produced by dispersal limitation, we conclude that dispersal limitation per se could create higher niche overlap, such that both species equivalence and habitatspecialization are important for coexistence on this forest.

FS04.P.49

Testing species-habitat association by using toroidal randomization processes: a powerful method?

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Spatial autocorrelation is a fundamental issue for ecologists. It prevents them to use classical methods to test associations between ecological variables because observations may often co-vary with geographical position, inflating the level of type I error. To overcome this issue, several authors have developed random torus-translations (toroidal randomizations) processes to test variable associations, a method that de-correlates variables while minimizing the loss of their spatial structure. Based on a geo-referenced dataset of tree individuals from Barro Colorado Island (Panama), we tested whether different torus-translation techniques did not lead to an excess of false positive. To do so, we first looked for species displaying strong correlation with an environmental variable. We then generated thousand times a random but realistic distribution pattern for each of those species, fitted with a parametric method. Finally, we evaluated the power of the toroidal method by checking whether the observed correlation was higher than 95 % of the correlations computed with simulated patterns. Tests are still undergoing but until now we did not find any excess of false positives among tested species, suggesting that toroidal randomizations remain interesting tools for ecologists.

FS04.P.50

By shifting species and traits, soil controls biomass and dynamics of an Amazonian forest

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The effects of soil on tree species composition and trait distributions in tropical forest, and how these interactions affect tree biomass and dynamics, are poorly understood because variation in soil is confounded with variation in climate over large areas. We excluded confounding due to climate by studying variation among 72 1-ha plots within 64 km^2, and minimized within-plot variation in soil and stand properties by using long narrow plots oriented along altitudinal contours in Reserva Ducke, Central Amazonia, Brazil. Soil variation caused shifts in tree species composition, which determined stand-level wood density. Soil clay content, plot mean wood density and one-dimensional ordination of tree species composition explained up to 40 % of variation in tree biomass and 19 % of variation in tree mortality. As pioneer species were not abundant, lower biomass and higher mortality on sandy soils is a consequence of dominance of species with low to medium wood density adapted to waterlogged and nutrient-poor sandy soils. Therefore, mesoscale variation in biomass and dynamics is caused by co-occurrence of species with similar traits in different regions of the edaphic gradient. Identification of mechanisms controlling tree biomass and dynamics in Amazonian forest will require better understanding of tree-soil physiologic interactions.

FS04.P.51

Influence of Soil Physical Properties on Plant Richness of the Mussununga Ecosystem, Brazil

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Distribution ranges of plant species are related to physical variables of ecosystems that limit plant growth. Therefore, each plant species response to physical factors builds up the functional diversity of an ecosystem. The higher the species richness of an ecosystem, the larger the probability of maintaining functions and the higher the potential number of plant functional groups (FGs). Thus, the richness potentially increases the number of functions of the highly diverse Atlantic Rainforest domain in Brazil. Severe plant growth limitations caused by stress, however, decrease species richness. In the Spodosols of the Mussununga, an associated ecosystem of Atlantic Rainforest, the percentage of fine sand is directly related to water retention. Moreover, the depth of the cementation layer in the Mussununga's sandy soil is a physical factor that can affect the plants' stress gradients. When a shallow cementation layer depth is combined with low water retention in soils and with low fine sand percentage, the double stresses of flooding in the rainy season and water scarcity in the dry season result. This study aimed to identify FGs among Mussununga plant species responding to water stress gradients of soil and to verify the effects of the gradients on plant species richness of the Mussununga. A Canonical Correspondence Analysis (CCA) of species abundance and soil texture variables was performed on 18 plots in six physiognomies of the Mussununga. Species richness rarefactions were calculated for each vegetation form to compare diversity. The two main axes of the CCA showed two FGs responding to soil texture and cementation layer depth: stress tolerator species and mesic species. Physical variables affect plant diversity, with species richness rising as the fine sand proportion also rises in the Mussununga. The effect of the cementation layer is not significantly related to species richness variation.

FS04.P.52

Effects of different cattle-ranching regimes on dung beetle communities in tropical Mexico

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Land-use change constitutes one of the greatest threats to biodiversity in areas of tropical forests. New paradigms are being proposed to fulfill two potentially conflicting goals: (i) conserving biodiversity and ecosystem functions, and (ii) improving the livelihood of local people. One of the starting points of these paradigms is that most tropical human-modified landscapes are not homogeneous but consist of a heterogeneous mosaic of habitats. One useful tool when comparing landscape elements regarding their ability to conserve nature is the use of indicator taxa. A group of insects commonly known as dung beetles (Scarabaeinae, Coleoptera), has been extensively used as an indicator taxon of habitat disturbance in tropical forest ecosystems. In this study we used baited pitfall traps to sample dung beetle assemblages in five landscape elements: primary and secondary forest, and, cattle ranches with high-, medium-, and low-intensity management regimes. We captured over 10,000 individuals of 23 species of Scarabaeinae. Number of individuals captured and biomass were lowest in the primary forest sites, and highest in the medium-intensity cattle-ranching sites. Rarefaction curves showed, however, that species richness were significantly lower in high- and medium-intensity cattle-ranching sites, compared to the other three habitats. Rank-abundance curves showed differences in community structure among the habitats, with notably higher dominance in cattle-ranching than in forest. We discuss how, result of studies like this may help us face the challenge of not only managing individual landscape elements, but managing landscapes integratively, in a way that we can achieve an acceptable and sustainable level for both nature conservation and livelihood improvement.

FS04.P.53

Primates in fragmented landscapes: a meta-analytical approach to understand drivers of local extinction in Neotropical forests

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Tropical forests have been increasingly degraded by the twin processes of habitat loss and fragmentation worldwide, with widespread detrimental effects on forest biodiversity. Primates are highly conspicuous, account for a disproportionate share of the arboreal vertebrate biomass in tropical forests, are huge icons for conservation, and represent the best studied mammalian order. Understanding their community-wide responses to habitat fragmentation can therefore help inform large-scale conservation polices and action. We compiled primate species occupancy data from 760 fragmented and continuous forest sites within 61 landscapes, examined by 98 studies right across the Neotropics to consider species-area relationships (SARs) and the additive effects of other external variables, such as hunting pressure (HP) and matrix type, in predicting primate responses to habitat fragmentation. Using a multi-level analysis, we investigated patterns of species retention both at a patch- (760 sites independently) and landscape-scale (patches nested within landscapes). Our results show the clear effect of patch area in explaining primate richness across the Neotropics when considering forest sites independently. Over and above classic area-effects, however, we uncovered a strong influence of HP in predicting species occurrence at the landscape level; landscapes exposed to high levels of HP exhibited lower z-values, suggesting that species would be driven to local extinction if hunting pressure persists. However, we failed to detect a clear effect of matrix type on species persistence, although this variable was poorly described in most studies. We highlight the key importance of including anthropogenic effects in a multi-level approach to assess the synergistic effects of land-use in explaining patterns of species persistence in fragmented forest landscapes. Both increasing the number of forest reserves and enhancing the enforcement of management restrictions inside protected areas can contribute significantly to the long-term persistence of full primate assemblages.

FS04.P.54

An evaluation of different assemblage metrics for studies on wildlife recovery during forest succession

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Ecological patterns associate with succession are clear and recurrent among systems. Although they have been studied mainly for plants, they should be similar for wildlife. During succession, net primary productivity decreases, creating a gradient of decreasing food availability for wildlife similar to the gradient of decreasing light for plants. At least for plants, this gradient promotes the turnover of species adapted to different environmental conditions. However, the decrease in net primary productivity is accompanied by an increase in plant biomass and vegetation height, which might mean an increased opportunity for niche partitioning and thus an increase in richness of animal assemblages. Given that these two environmental gradients should lead to distinct changes in animal assemblages (composition and structure versus richness), here we aim to investigate which assemblage metrics is more appropriate to detect changes in small mammal assemblages during succession. We surveyed 27 sites in three successional stages in a continuous Atlantic Forest area, where we captured 24 small mammal species and collected data on vegetation structure used in a PCA summarizing the main structural changes during succession. The effect of succession on total abundance and richness was tested with ANOVAs and regressions. Community structure and composition were synthesized using MDS ordinations (abundance or presence/absence matrices, respectively), and the influence of succession was tested with an indirect gradient analysis and permutation tests. Although richness, total abundance, community structure and composition were not significantly influenced by succession, community structure was the metric more associate with succession given consistent patterns of change in abundance of part of the species. Our results suggest that wildlife changes during succession may be subtle and simple metrics that do not consider species abundance may not be appropriate for studying wildlife recovery.

FS04.P.55

THE IMPACT OF HUNTING ON MAMMALS COMMUNITY IN A HUMAN SETTLEMENT IN THE NORTHERN BRAZILIAN AMAZON

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The Amazonia holds a high diversity of mammals, which are an important source of food for their inhabitants. Hunting, however, can have a strong negative impact upon the mammal community. The current study compared sighting rates, relative abundances and biomasses and group sizes of medium-sized and large mammals, as well as characterized and quantified hunting pressure, in two sites of the state of Roraima, Viruá National Park (protected) and Novo Paraíso human settlement (hunted). We recorded 33 species, of which 25 were in the Novo Paraíso human settlement, and 21 in the Viruá National Park. There were no significant differences on sighting rates, relative abundances and biomasses and group sizes of mammals between the two areas, although the totals were higher in Viruá due to the high abundance of *T. pecari*, which was not recorded in Novo Paraíso settlement. This suggests that *T. pecari* may be in the brink of local extinction, mainly for having been the most hunted species in the settlement. Through interviews with 50 hunters we estimated that, in 37 years, 31,458 mammals of 42 species were harvested. There was a positive significant relationship between the hunted biomass and the relative biomass, which suggests that hunting is directed towards larger species and also to the most abundant ones. However, our results also suggest that hunting intensity in Novo Paraíso settlement is sustainable in the short term (except for *T. pecari*), but that the hystoric decline in hunting efficience indicates that abundances could have been higher in the past. This highlights the need for measures that maintain hunting activities in sustainable levels.

FS04.P.56

Small mammal population dynamics in a savanna-forest mosaic along the Caatinga - Atlantic Forest border

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The northeastern corner of South America is marked by a strong rainfall gradient, that determines dramatic changes in vegetation, ranging from moist tropical forests (Brazilian Atlantic Forest) close to the coast to semi-arid shrublands (Caatinga) in the hinterland. Small mammal communities also change widely along this gradient. The objective of this study is to compare population dynamics of rodent and marsupial species in a forest/savanna mosaic close to the Caatinga / Atlantic Forest border. The study site was located in the REBIO Guaribas, a 3000 ha forest/savanna fragment immersed in sugarcane plantation matrix. Vegetation inside the reserve was a mosaic of secondary semi-deciduous forest and savanna on sandy soil. This kind of vegetation was described as “Ecological Tension Zone”. This study lasted one year, including the La Niña (rainy) phase of the ENSO cycle. We set one trap-line 300 m long with Sherman traps set on the ground and on shrubs. We made a total trap-effort of 3600 trap-nights. We captured 30 individuals of 6 species, mostly marsupials (Didelphidae), and few rodents (Muridae). The clearest pattern was a succession of waves of individuals entering the study area along the year: Didelphis albiventris, Monodelphis domestica and the exotic Rattus norvergicus after the nearby sugarcane plantation was harversted, Necromys lasiurus just after the onset of dry season, and Marmosa murina at the late dry season. Autoctonous recruitment was observed for Didelphis albiventris and Marmosa murina, but most of these waves seem to be related either to population excess, or to habitat degradation in nearby habitats, namely continuous forest and savanna patches and sugarcane plantation.

FS04.P.57

Environmental and historical drivers of small mammals communities in South America

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Patterns of species composition are affected by ecological and biogeographical factors. Non-volant small mammals (mainly Cricetidae, Echimyidae and Didelphidae families) have interesting and unique histories of colonization in the South American continent. We aimed to evaluate the main drivers of community composition of small mammals in South America, considering their historic invasion of the continent and the current climate and land cover. We compiled published data of 82 communities across South America. For each community, the occurrence of Didelphidae, Cricetidae and Echimyidae species was described. We used five climatic and six land cover variables, as well as one historical variable: the biogeographical distance of each community to a point in Isthmus of Panama, which played an important role in the colonization of South America. We generated principal coordinates of species richness per family and the two resulting ordination axes were used as response variables in further analyses. Climatic and cover land predictors were selected using Akaike's information criterion. The influence of climatic, cover land and historical variables in the principal coordinates of species richness was evaluated using path analysis. Annual mean temperature was the most important climatic factor for both axes. Shrubs and herbaceous cover affected the first axis which separated the communities described for cricetids from those described by marsupial species. Mosaic areas were important to the second axis, which separated the communities characterized by echimyids from the others. The negative association between low shrub/herb cover and marsupials can be explained by their predominantly arboreal habits. Biogeographical history and small mammal communities were not directly related. Nonetheless, this factor affects the marsupial and Cricetid communities indirectly through climate. Environment mostly determined the structure of small mammal communities in detriment to history, showing that current climate and some local processes may be driving the assembly of small mammals into communities.

FS04.P.58

PRELIMINARY STUDY OF MEDIUM AND LARGE SIZE MAMMALS IN THE SÃO JOÃO RIVER BASIN, CARAMBEÍ, PARANÁ – BRAZIL

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ABSTRACT

Mammals are suffering with the destruction and fragmentation of their natural habitat, and a lot of species are threatened of extinction and in consequence causing damage to the biodiversity due to the loss of natural environments. The objective of this work was to accomplish a survey of medium and large size mammals occurring in the São João River Basin, located in the municipal district of Carambeí. Indirect methods of analyses were used as footprints, feces, among other vestiges left by these mammals. The studied area is of Mixed Ombrophilous Forest with influence of fields and savannah with climate of the type Cfa and Cfb. The samples were taken during the months of January, February and March of 2012, with biweekly intervals and one day duration, beginning at dawn and ending in the evening. In three months of research it was possible to observe a total of 33 wild mammals distributed in 8 species belonging to 4 orders. The species found were: *Cerdocyon thous, Puma concolor, Leopardus pardalis, Dasypus novemcinctus, Mazama gouazoubira, Tayassu pecari, Dasyprocta azarae* e *Lontra longicaudis.* This study area possesses countless sandbanks edging the São João River and also some highway stretches, which facilitated in the identification of the footprints left by the mammals. Due to the number of identified individuals in three months of studies, it can be observed that this place possesses great diversity of species. From the results obtained until now, it is possible to verify the importance of the area in order that protection and conservation measures are taken to guarantee the survival of the existing species.

Key-words: survey, indirect methods, conservation, protection

FS04.P.59

OCURRENCE OF *Puma Concolor* (LINNAEUS, 1771) IN THE SÃO JOÃO RIVER BASIN LOCATED IN THE MUNICIPALITY OF CARAMBEÍ, PARANÁ - BRAZIL

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ABSTRACT

Puma is the second largest feline in the Americas. Due to its size and type of diet, these big cats need a large area to survive. The objective of this study was to survey, for the first time, the amount of existing cougars in São João River Basin, located in the municipality of Carambeí. Through the footprints analysis left by the pumas it is possible to identify the existence of species in a certain place. Depending on the quality of the impression left by the animal the age and the areas frequently used by the species can be ascertained. The studied region is of Mixed Ombrophilous Forest, with influence of fields and savannah. According to Köppen the climate is of the type Cfa and Cfb. To date six samples were collected during three months of research, which were accomplished in January, February and March 2012 and will continue until December 2012. During these three months of study nine puma footprints have been found and analyzed, measured, photographed and plaster molds made. All characteristics of the tracks were observed and taken into account, whether it was from the right or left paw, fore or rear paw. From those nine footprints found it was possible so far to identify the existence of five adult cougars in this area of study. *Puma concolor* is an indicator of an environment still well preserved. The number of pumas found at this place suggests the existence of a great diversity of other species also occurring in this area.

Keywords: footprints, puma, feline, Carambeí

FS04.P.60

Evaluation of the proline content in rhizophores of *Vernonia herbacea* (Vell.) Rusby native region of campos rupestres in Minas Gerais.

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Vernonia herbacea is a species that occurs in cerrado regions which face long periods of water scarcity. Accordingly, some plants have the ability to produce substances such as amino acid proline, which allow the water retention in the tissues, so that they remain so swollen and intact. However, studies about its real function in the plant under stress are not yet conclusive. The objective of this study was to evaluate the relationship between this amino acid and seasonality characteristic of campos rupestres in Minas Gerais. Plants *V. herbacea* were collected monthly and proline content in the rhizophore was analyzed by extraction with sulfosalicylic acid, ninhydrin acid, glacial acetic acid and toluene. In each tube, the upper layer (red) was recovered and subjected to spectrophotometric reading at 520 nm. The content of proline were estimated from a standard curve of increasing concentrations of L-proline. The content of proline in 2010, August and September, showed values (in a µmol.g-MS) of about 1.2, in October: 1.39, November 1.97, December: 1,6. And in 2011, in January, 1.8; February: 1.6, March and April: 1.5; May: 2.3; June: 1.3; July: 1.4. Based on the literature, one can say that the values observed in this study are considered low and do not represent a significant meaning when considering their participation in the process of osmoregulation. For some authors, proline can act as a biochemical marker of metabolic disturbances generated by different types of stress. In this study, the highest value observed precedes the period of water scarcity (May), so the proline may, in this case, have served as the environmental stress signaling what was to be established, since this month marks the beginning of this numbness species.

FS04.P.61

Role of groundwater depth and salinity in determining composition of tropical forest communities in coastal Everglades

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Here we examine groundwater salinity and depth and use the data to explain differences in species composition among coastal plant communities. Specifically, we conducted field studies in coastal buttonwood (dominated by *Conocarpus erectus*) and tropical hardwood forests (dominated by *Piscidia piscipula*, and *Eugenia foetida*) to monitor seasonal patterns of groundwater salinity from February 2011-2012. We established permanent plots to determine tree and shrub species composition, and water uptake depth of five common coastal hammock species, and a rare endemic herb (*Chromolaena frustrata*) of buttonwood forests using isotopic analyses. We compare isotopic signatures of oxygen and hydrogen in plant stem tissues with ground, soil and rain water collected in the field.

Groundwater salinity was slightly to highly brackish (6-20‰) in hardwood hammock followed by transitional hammocks where salinity was highly brackish (24-28‰) and buttonwood hammocks with highly brackish to saline (25-35‰) groundwater. Depth to water table ranged from 20 to > 100 cm in hardwood hammocks and 10 to > 100 cm in buttonwood forests. Species showed heterogeneity in water uptake depth in dry season, in wet season the signatures were mixed except for *Chromolaena frustrata*, which used surface soil water in both wet and dry seasons (0-5 cm). *Piscidia piscipula* used water from deepest soil layer and groundwater. *Conocarpus erectus* and *Capparis flexuosa* utilized water from 5-15 cm depth, and *Eugenia foetida* from intermediate soil depth (5-15 cm). Elevation measured to nearest cm suggested that differences in groundwater salinity and depth showed a better correlation with distance from the coast than the surface elevation. Small differences in depth to water, and salinity tolerances make coastal hardwood forests prone to degradation as a result of rising sea levels.

FS04.P.62

Growth and biomass allocation in three rupestrian field species at high and low soil fertility

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Due to edaphic and climate-related stressing properties of rupestrian field, it is expected that its native plants show a stress resistance syndrome, characterized mainly by an inherently slow growth rate and low phenotypic variation. The aim of this study was to evaluate the growth and biomass allocation responses of three species of rupestrian field under contrasting nutritional availability: *Actinocephalus bongardii* (Eriocaulaceae), *Jacaranda caroba* (Bignoniaceae) and *Tibouchina heteromalla* (Melastomataceae). In December 2002, an experiment was carried out in a greenhouse located on a rupestrian field area at the Reserva Natural Particular Vellozia, Serra do Cipó, Brazil. Seedlings were grown on two substrates with contrasting fertility conditions: infertile (with soil adverse chemical features found in degraded quartzitic areas) and fertile (a soil commonly used substrate in greenhouse seedling production). One year after sowing, above-, and below-ground dry biomass were determined. The dry biomass of the three species was higher in the fertile substrate compared with the infertile one, being 16 fold increased in *A. bongardii*, 68 fold increased in *J. caroba* and 5 fold increased in *T. heteromalla*. The root biomass in the fertile soil was significantly higher than the infertile condition only in *J. caroba* (79 fold increase) and *T. heteromalla* (5 fold increase). The biomass allocation was significantly different only in *A. bongardii*, with the root biomass allocation six fold increased in the fertile treatment. The three species responded positively to the high fertility condition (*i.e.*, did not show a low phenotypic variation). On the other hand, even if *A. bongardii* had shown considerable phenotypic variation in biomass allocation, the results of this study corroborated previous studies suggesting that the rupestrian field species present generally a low phenotypic variation only in the capacity to change the biomass allocation in response to contrasting resource availability. Financial support: FAPEMIG and CNPq.

FS04.P.63

Controls of soil organic carbon stability in old-growth forests across the Amazon Basin

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Environmental conditions such as edaphic properties, climate and organic matter quality are main factors that control soil organic carbon (SOC) concentration in the more stable or labile fractions. The carbon stability is related with its decomposability and residence time in the different pools. Understanding the factors involved in carbon stabilization in tropical forests would be important to accurate models of SOC dynamics and ecosystem function. Considering the wide variation in environmental parameters, we could expect variable SOC stability across the Amazon Basin. The aim of this study is to answer the following questions: (i) how SOC fractions are distributed among different soil types, at the depths 0-5, 5-10, 10-20 and 20-30 cm and, (ii) what is the role of soil properties, climate and organic matter quality on controlling SOC and its fractions across the Amazon Basin. We carried out the study in 30 1-ha old-growth rainforest plots in Brazil, Peru, Colombia and French Guyana, comprising 10 main soil types. Our results showed that total and fractionate SOC concentration varies following a soil weathering gradient. We found larger proportion of stable SOC in the silt+clay fraction in highly weathered soils. Also, we found higher proportion of SOC associated with stable aggregates in Ferralsols and Acrisols. SOC fractions concentrations decrease disproportionally with depth in all soil types. The most stable SOC fractions were significantly related to edaphic factors, such as soil texture and crystalline Fe and Al oxides. Concentrations of SOC in light fraction were better explained by litter lignin, a proxy to organic matter quality, more than edaphic properties. Finally, we have found no direct effect of climate variables on SOC fractions. In conclusion, fractions of SOC should be explored to model soil carbon dynamics in the Amazon Basin, as they present large variation in their properties and concentrations.

FS04.P.64

Time of Activity of *Merosargus* Loew (Diptera: Stratiomyidae) in Parque Estadual do Rio Doce - MG, Brazil

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Merosargus Loew (Diptera: Stratiomyidae) is a genus restricted to the New World, with 143 described species. Merosargus species coexist and compete for oviposition substrates. Thus, males patrol and defend a territory where it can find vegetative organic matter as substrate for female oviposition. Therefore we tested the hypothesis that differences in behavior, physiology and morphology could mitigate or prevent competition. This study aimed to verify the time of activity of *Merosargus* and to investigate whether behavior was related to body size throughout the day. This study was conducted in three areas of Parque Estadual do Rio Doce park, in Southeastern Brazil using as substrate 20cm pieces of *Heliconia* (Heliconiaceae) pseudo-stems. These were placed 25m away from each other at three sites, each containing: a piece of *H. spathocircinata,* a green *H. episcopalism,* and one rotten *H. episcopalis*. The sites were surveyed continuously (9:00 to 18:00) and the adults attracted were collected and identified. Data were analyzed by applying a two-way ANOVA test. The larger species (*M. gowdeyi;* mean = 10,39mm) showed peak in activity between 10:00 and 12:00; the intermediate species (*M. gracilis;* mean = 9,15mm) between 12:00 and 14:00; and the smaller species (*M. azureus;* mean = 8,27mm) between 14:00 and 16:00, suggesting a relationship between time of activity and body size. This difference in peak activity may be a strategy to avoid interspecific competition and reproduction in congeneric species, but may also be related to thermoregulation of the flies. Experiments showed that larger Syrphidae flies were more active at low temperatures and that smaller flies appeared only after temperatures rise.

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FS04.P.67

POPULATION DENSITY AND NESTING PATTERNS OF THE WESTERN CHIMPANZEE, PAN TROGLODYTES VERUS, IN LAGOAS DE CUFADA NATURAL PARK, GUINEA-BISSAU.

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Tropical forests are under severe threat and disappearing at alarming rates as a result of destructive human activities such as agriculture, logging, and mining exploitation. Biodiversity of *Lagoas de Cufada* Natural Park (LCNP), Guinea-Bissau, has been severely affected by these human activities. Since 1988, the western chimpanzee, *Pan troglodytes verus*, has been classified as “endangered” by the IUCN. However, information on the population status of the species from Guinea-Bissau is lacking. The overall goal of this study is to assess the impact of human land-use change on the LCNP chimpanzee population and to contribute with valuable data to future assessments of the subspecies’ conservation status. Distance sampling and nest counts were conducted at eleven systematically placed linear transects. All nests visible from the line transect were recorded. Transects were visited repeatedly during 5 visits with 2-week intervals. Only nest data from the first survey were included to estimate nest density; strip sampling was subsequently used to estimate chimpanzee density based on all repeat visits, which combined with the nest density estimate, allowed us to obtain 34.91 days as an estimate of nest decay rate. Thus, using the standing crop nest count method we obtained a weighted average of 0.861 chimpanzees/km^2 (0.355-2.086, 95% CI), corresponding to 1703 chimpanzees estimated to occur in LCNP in 2010. A half-normal model with cosine adjustment best fitted the nest data (DeltaAIC=0.23). Although chimpanzees used 23 different tree species for nest building (n=451 nests), nests were typically constructed at approximately the same height (ca.16m, SE=0.18), independent of habitat type and tree species. Moreover, chimpanzees preferentially chose closed forest (52.11%) and *Diallium guineense* for nesting (52.33%). These results indicate clear nesting preferences related to habitat type and tree species. I will present GLMM modeling results relating nest occurrence and abundances to potentially important ecological and environmental predictors.

FS04.P.68

RICHNESS AND ABUNDANCE OF MAMMALS IN A TERRA FIRME FOREST AT CENTRAL AMAZONIA, BRAZIL

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The Amazon is the region of highest biodiversity on the planet. However, the distribution and abundance of mammals of medium and large size are still poorly studied. Mammals have an important role in food chains, natural ecosystems, seed dispersal, and for the conservation of biodiversity in general. One factor is the lack of standardization of collection methods that allow comparisons with other areas and data collected over different periods. The present study aimed to describe the composition and community structure of mammals of medium and large size in an terra firme forest in Central Amazonia, comparing different sampling periods. We use standardized visual censuses in a grid of 24 km^2 in an area of primary forest 38 km from Manaus in October and November 2008, December 2011 and February 2012 on all tracks that of the grid. During the 26 day census period 232 km were coverd and 158 sightings obtained, totaling 21 species in six orders (Artiodactyla, Carnivora, Perissodactyla, Primates, Rodentia, and Xenarthra). Primates and Rodentia orders were most frequently observed, representing 88% of the total number of records. Within these orders *Sapajus apella* (18% and 19%) and *Myoprocta acouchi* (24% and 19%) were the most abundant species. The abundance and richness did not vary between sampling periods. It is possible that the populations and communities are temporally stable due to the high integrity of the study area. Knowledge about the temporal variation of composition and species diversity in contiguous areas is essential to guide management and conservation plans because the ecological importance of large mammals for dispersal and seed predation. It also allows the establishment of parameters for comparison of diversity and community structure with other areas.

FS04.P.69

Estrogenic contaminants contribute to amphibian decline

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Declines of the amphibian populations are a global problem with complex causes. Peculiar characteristics, such as skin permeability and life cycle dependent of the aquatic environment, become these animals vulnerable to aquatic contaminations. Industrial and municipal effluents and agricultural substances are the main sources of endocrine substances discarded in the aquatic environment. Sexual hormone 17β-estradiol is a potent organic contaminant that is prevalent in surface waters. Estrogenic and other endocrine disrupting compounds are assumed to contribute to the worldwide decline of amphibian populations, mainly in interferences via of sexual differentiation. This study show the effect caused by 17β-estradiol in the reproduction of anuran *Rhinella schneideri* and the possible risks posed by the substance in the conservation of this species. We used 40 adult males of *Rhinella schneideri* and analyzed the spermatogenesis 3, 7, (short effect) 15 and 30 (long effect) days after 17β-estradiol exposition. Results showed that 17β-estradiol promotes high alterations in spermatogenesis patterns of males. All animals of the experimental groups had a decrease of the spermatozoa production ($F_{(2,2)}$=33.39; p<0,0001). Amount of initials cells, as spermatocytes, were also disturbed in experimental groups ($F_{(2,2)}$=40.20; p<0,0001). Animals of short effect had larger amount of spermatocytes (41.827±851.038; mean±SE) that long effect group (25.637±64.09; mean±SE). Seminiferous locules, place where the male cells are produce, had reduction of the area in 15 and 30 days after of 17β-estradiol ($F_{(2,2)}$=13.88; p<0,0001). The results show that long exposure to the 17β-estradiol causes spermatogenesis disorganization in masculine gonads, demonstrating its profound action on species reproduction. Human impacts have been a major contributor to the decline of global amphibian diversity in several factors. Our data showed that estrogenic exposure could reduce the reproductive success of males and these effects might contribute to the global problem of amphibian decline.

FS04.P.70

Reproduction of neotropical rodents: patterns and possible influences of climate changes

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Climate change could directly affect biodiversity by inducing changes in species reproduction patterns. Because reproduction and lactation are high-energy demanding processes, for many species, breeding coincides with the period of highest food availability, which is generally determined by climate. Mammal diversity in the Neotropics is concentrated in non-volant small mammals, comprising didelphid opossums, cricetid and echymidae rodents. Among them, reproduction patterns of cricetid rodents - the most diverse small mammal group - are largely unknown. While the breeding period of opossums occurs in late dry/ early wet seasons, with lactation coinciding with the period of highest food availability, for cricetid rodents available data is scarce and inconclusive. Using a unique capture-recapture dataset from three 2-ha grids over almost 2 years in a continuous Atlantic forest area (São Paulo, Brazil), we analyzed reproductive patters for five cricetid rodents (*Akodon montensis, Brucepattersonius soricinus, Delomys sublineatus, Euryoryzomys russatus* and *Olygoryzomys nigripes*). The frequencies of reproductive individuals among early and late wet and dry seasons were compared with repeated-measures ANOVA. For all species but *A. montensis* we found no seasonal difference in the frequency of reproductive individuals. For *A. montensis* reproductive individuals are more frequent in the late dry season ($F= 6.7$; $p= 0.01$). Our results indicate that reproduction for most studied cricetid rodents is independent of seasonal variations, suggesting that climate change should affect less this diverse group of small mammals than didelphid marsupials.

FS04.P.71

Singleton species of Odonata in a Neotropical stream survey

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High frequency of singletons (species represented by a single individual) in tropical insect inventories is a common pattern. We sampled 53 species of Odonata in 46 low order streams in a landscape characterized by a mosaic of semi-deciduous Atlantic Forest and Cerrado in the central-west region of Brazil. Sampling was carried out between April 2010 and April 2011 with a 1 hour sampling effort made by an observer / collector, covering an area of 100 meters of riparian forest. The specimens were captured with an insect net at warmer times of day (between 10 AM and 3 PM), as the insects are most active at these times. We found 16 singletons (30% of Odonata species sampled). Our result is similar to those of several tropical arthropod surveys (averaging singleton frequencies of 32% of species). Among the explanations for this pattern, we can reject that singletons tend to be small and therefore missed, because our singletons were of various sizes. Three non-exclusive explanations seem to explain our findings: i) singletons are ‘cryptic’; ii) source-sink phenomena and iii) an artifact of undersampling. The high singleton frequencies in our study, partially attributed to under-sampling, indicate that Odonata species richness is larger than measured and the inventories of this group in Neotropical streams should be more intensive. High frequency of singletons (species represented by a single individual) in tropical insect inventories is a common pattern. We sampled 53 species of Odonata in 46 low order streams in a landscape characterized by a mosaic of semi-deciduous Atlantic Forest and Cerrado in the central-west region of Brazil. Sampling was carried out between April 2010 and April 2011 with a 1 hour sampling effort made by an observer / collector, covering an area of 100 meters of riparian forest. The specimens were captured with an insect net at warmer times of day (between 10 AM and 3 PM), as the insects are most active at these times. We found 16 singletons (30% of Odonata species sampled). Our result is similar to those of several tropical arthropod surveys (averaging singleton frequencies of 32% of species). Among the explanations for this pattern, we can reject that singletons tend to be small and therefore missed, because our singletons were of various sizes. Three non-exclusive explanations seem to explain our findings: i) singletons are ‘cryptic’; ii) source-sink phenomena and iii) an artifact of undersampling. The high singleton frequencies in our study, partially attributed to under-sampling, indicate that Odonata species richness is larger than measured and the inventories of this group in Neotropical streams should be more intensive.

FS04.P.73

Substratum particle size does not affect the relationship of biomass and abundance of aquatic insects in a neotropical stream.

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Abstract

The aim of this work is to analyse the influence exerted by the size of the substratum particle on the relation between the biomass and abundance of aquatic insects in a stream of Intervales State Park, situated on the Paranapiacaba Mountains, São Paulo State, Brazil. In this stream were collected natural and artificial substrates with different granulometries. Five granulometric levels were considered (1=sand; 2= from 0.5 to 1.5 cm; 3= from 1.5 to 2.5 cm; 4= from 2.5 to 5 cm; 5= from 5 to 10 cm), each level was represented by a set of eight trays. The biomass and abundance characteristics for each taxon were logarithmized. The variables biomass and abundance were related in order to test the EER (Energy Efficiency Ratio) (beta = -0,75). To test possible variation in EER, data from the natural substratum and trays with different granulometries were analysed. Data from the different types of substratum did not confirm the EER. The present work enhances the little generality to the EER, and suggests that this rule occurs only for specific environmental and biotic conditions. Thus, generalizations on EER can be inappropriate to aquatic insects in streams.

Keywords: Aquatic insects; biomass; body size; granulometry

FS05.OC.01

Why do Pheidole oxyops ants place feathers around their nests?

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The ant species *Pheidole oxyops* has the particular behavior of placing feathers on the edge of their nests entrances. Due to this habit, we aim to answer the question: why do *Pheidole oxyops* ants place feathers around their nests? We tested two hypothesis (1) *P. oxyops* use the feathers as a structure for obtaining water, as the feathers may act as night moisture retainers and (2) *P. oxyops* use feathers for arthropod attraction, due to its essentially carnivore diet and its particular nest structure, which acts as pitfall traps. We collected data from Estação Ecológica do Panga, a natural reserve of Cerrado and campus Umuarama of Federal University of Uberlândia, Brazil. To test hypothesis (1), we chose 26 nests of *P. oxyops* and removed all the feathers from the edges of these nests. After 24h, we placed hydrophilic cotton balls around the nests (treatment group). The cotton balls were moistened every 12h, during 72h as to act as a water source for the colonies. In the other group, new feathers were removed during the same 72h (control group). After this, a full hand of new feathers was offered to all nests. We expected that the control group should collect more feathers, as it had a lower water supply. To test hypothesis (2), we established two plots with 20 pitfall traps in each one. The traps were placed in four lines of five traps. In each plot, 15 feathers were placed around 10 randomly selected traps. We expected that feathers around pitfalls would result in the collection of more species and a higher abundance of arthropods. Only hypothesis (2) was accepted. These results indicate that feathers enhance the capture rate of arthropod prey by *P. oxyops*.

FS05.OC.02

Ant-preying dipteran larvae exploit a facultative mutualism between ants and *Qualea grandiflora* (Vochysiaceae)

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Foliage-dwelling ants frequently establish facultative mutualisms with plants bearing extrafloral nectaries (EFNs). *Qualea grandiflora* is a typical tree of the Cerrado savanna that bears paired EFNs on the stem, and visiting ants have been demonstrated to deter herbivores in exchange of the plant's nectary secretions. In the cerrado of Itirapina (SE Brazil), larvae of *Medetera* sp. (Diptera: Dolichopodidae) construct sticky shelters on the EFNs of *Qualea*, blocking the access of insects to the glands. EFN-feeders, particularly ants, frequently get trapped in the shelter and are devoured by the resident larva. By preying on ant bodyguards near EFNs, we asked whether *Medetera* could be acting as a parasite of the ant-*Qualea* mutualism. Specifically, we investigated if (1) the intensity of ant foraging on plants influences infestation levels by *Medetera*; (2) the species composition of *Medetera*'s ant prey differs from the species composition of visiting ants; (3) the presence of ant-preying larvae affect the ant foraging pattern on the plant. We recorded the number of dipteran larvae and levels of ant visitation (day and night) on 30 plants. We also monitored attacks by ants to live termite-baits on paired branches with and without *Medetera* (20 plants). Ant prey trapped at *Medetera*'s shelter was sampled from 25 plants. Ant visitation and aggression to termites on leaves were lower on *Medetera*-infested than on *Medetera*-free branches of *Qualea*. Infestation by *Medetera* was higher on plants with intermediate levels of ant visitation. The species composition of ant prey is similar to that of general ant visitors to EFNs. Our data show mutual negative effects between ants and *Medetera*. Decreased ant visitation and aggression on leaves of *Medetera*-infested branches suggests that ant-preying larvae can potentially decrease anti-herbivore effects by ants on *Qualea*. Therefore, *Medetera* can be considered a parasite of this ant-plant mutualism. (FAPESP, CNPq, FAEPEX).

FS05.OC.03

Vertical stratification of ant interactions within a panamanian tropical forest canopy mosaic

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We introduce a refined sampling design to detect and describe ant mosaic dimensions in upper and lower canopy within a complex tropical forest. We test the hypothesis that interactions in the ant mosaic are stronger in the upper than in the lower canopy. We used a research crane for canopy access to assess ant defensive behaviours and recruitments in the Parque Natural Metropolitano, Panama. Sardine-honey baits were set within a grid of 25 parallel upper and lower canopy points, in which co-ordinates and height were recorded. We sampled 23 ant species, with *Azteca* (*A. trigona*, *A. velox*, *Azteca* sp. nr. *chartifex* and *A. snellingi*) being by far the most abundant genus, recruiting to 63% of baits and excluding all other ant genera. *Camponotus* (*Myrmobrachys*) sp.1 also showed a statistically significant exclusion of other ant species over 95 % of its occurrence. *Cephalotes umbraculatus* and *Dolichoderus bispinosus* had exclusive occurrences in smaller areas. Exclusion between dominant species was more frequent in the upper than lower canopy. Permeable borders and mosaic-free spaces seem important for ant species diversity, and were more frequent in the lower canopy. Here, a combination of more costly patrolling conditions and less profitable resources, such as extra-floral nectaries and trophobionts, may be the most likely cause of this pattern. (The study was supported by CAPES/PROF, CNPq and FAPEMIG).

FS05.OC.04

The effect of different fire regimes on arboreal ant diversity in a Neotropical savanna

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Fire is a ubiquitous form of disturbance in various biomes. In the Cerrado, the largest Neotropical savanna, vegetation often burns during the dry season (May-September) because of natural and anthropogenic causes. We investigated the long term effects of different experimental fire regimes on the abundance, species richness, and composition of arboreal ants in a savanna reserve near Brasilia, Brazil. Five fire regimes were compared: unburned since 1971, control (C), early-season biennial fires (E), mid-season biennial fires (M), late-season biennial fires (L), and quadrenniall mid-season fires (Q). The treatments were applied during a consecutive period of 15 years. There were four replicates plots per treatment. Baited pitfall traps were placed in 16 trees per plot. We collected a total of 28.596 workers from 77 species. More than 80% of the species occurrences belonged to only 20 species. Mean species richness per plot was significantly lower in the L than in the remaining fire treatment. Ant abundance was similar between treatments. Multidimensional Scaling (Bray-Curtis dissimilarity) separated all C and two of the E plots from plots in the other fire regimes. Overall ant diversity was partitioned additively into: α_1, within-tree; β_1, between-trees; β_2, between-replicates and β_3, between-treatments. Both α_1 and β_3 were higher than expected ($p < 0.003$). We conclude that differences in fire regimes can influence the structure of arboreal ant communities. The timing of burning (whether early, in the middle or late during the dry season) seems more relevant than the frequency of fire (2 vs 4 years interval). The high turnover of species between treatments also suggests that an appropriate fire management can result in higher species richness than the complete fire suppression, either by applying early-season burning or by creating a mosaic of patches with different fire histories.

FS05.OC.05

Small-scale habitat fragmentation effects on litter-dwelling ants

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Habitat fragmentation is currently an important landscape driver throughout different biomes. Indeed the fully knowledge of its consequences to biodiversity is awesome, resulting on great interesting from conservation researchers. Remnant isolation is one of the main consequences of a fragmentation event, the reason why connectance through ecological corridors has been increasingly suggested. Our objectives were to test isolation effects on extinction, colonization and turnover rates of a litter-dwelling ant assemblage, and to evaluate ecological corridors effectiveness to mitigate habitat fragmentation consequences. For that we used a mesocosm manipulative design, with different isolation treatments, aiming to overcome major methodological drawbacks tied with fragmentation studies. Fragmentation caused an ongoing decrease in ant species richness, probably due to a negative balance between extinction and colonization. Extinction was steady along time, while colonization decreased along time. This outcome highlights the key role that colonization plays on the persistence of populations of litter dwelling ants. Turnover rates increased along time after fragmentation treatment connected by ecological corridors, while in the other treatments it remained steady and equal. Ecological corridors seem to have been used by species to arrive and leave remnants, therefore acting as a “two way traffic road”. Average literature on ecological corridors measure their effects only on the isolated habitat, discussing corridors role just as a route for fauna from a main source to rescue fauna in a remnant, and thus mitigate isolation effects on patches. Nevertheless, it may be an important escape route for threatened species, conserving then anyway.
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FS05.OC.06

How much are the protected Riparian Forest areas effective for ant biodiversity conservation?

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Riparian forests represent an endangered ecosystem closely related to the maintenance of the volume and quality of water supply in both local and regional scale. Furthermore, riparian areas work also as habitat and refuge to a sort of animal groups. Recent studies points out that even a network of narrow and small forest patches can harbour high numbers of species and are important to the conservation of regional biodiversity. Considering the importance of ants to ecosystems, we investigated if the riparian forests present a distinctive ant species composition and if the species composition changes as a function of distance from the river. Our results do not support the hypotheses that congruence in riparian ant species community exists irrespective to the river studied. Each one of the four studied areas presents a characteristic ant species composition, though the overall species richness was similar in different rivers and width of the protected areas. Comparison between transects in each studied area showed that ant species composition varies only when transects are more length, which is related to larger distances from river course and higher sampling effort. Differently of results found for samples at larger rivers, the species composition of samples at transects inside narrow protected riparian areas did not differ significantly from each other. All studied river margins presented the same pattern of species similarity between sampling points, for soil and arboreal ants, but each studied area presents a particular community composition. Nevertheless, if the aim of permanently protected areas is to conserve biodiversity, the forestry law deserves attention because riparian areas can present a rich fauna, although very small areas associated to narrow rivers apparently do not protect them. (The study was supported by CAPES/PROF, CNPq and FAPEMIG)

FS05.P.01

ANT GENERA RICHNESS, ABUNDANCE AND COMPOSITION AMONG DIFFERENT SUCCESSIONAL STAGES IN A MONTANE FOREST IN SOUTHEASTERN BRAZIL

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This study aimed to compare the diversity and composition of ant genera in forest litter habitats from different successional stages of a montane forest in Southeastern Brazil. In Itacolomi State Park, Minas Gerais State, three areas were selected to perform the sampling: an early forest succession with short stature trees and little distinction between canopy and understory, an area at intermediate succession with understory trees and a rough canopy layer, and an area of late succession with well structured and separated understorey and canopy. Within each area were selected trees distant at least 30m between them from which were drawn perpendicular transects. Sampling was carried out by the method of mini-Winkler in the dry season and early rainy season of 2006. We analyzed species richness and abundance distribution between the areas, as well as species composition. Both genera richness (as a surrogate of species diversity) and abundance were greater in the intermediate and late succession compared to early succession site, but differed also between places within each succession stage (Nested ANOVA, $p < 0.05$). We found that despite the existence of idiosyncratic fauna in a few early succession places (PCA, three sites departuring from expected similarity), most of that site had a sub-sample of the fauna found in intermediate and late succession sites (Detrended component analysis). On the other hand, late succession differed substantially in genera composition from the other two sites (Detrended component analysis) This study was supported by CAPES/PROF, CNPq and Fapemig.

FS05.P.02

The role of plant cover and density in an arboreal ant community of rupestrian field

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The response of the arboreal ant community to environmental variables was evaluated in a rupestrian field dominated by *Eremanthus erythropappus* (Asteraceae). The study was conducted in October 2011 in Ibitipoca State Park, Minas Gerais, Brazil. At each of the 30 sampling points, distanced 20m, one arboreal pitfall trap was installed in an *E. erythropappus* tree to capture arboreal ants. We also measured the following variables: richness and density of tree and shrub species (plants were counted if the circumference at the base of the stem - cab - was equal or upper than 10cm), plant cover and plant average size (cab and height). The effects of these variables on ant richness were tested by GLM. In this study we captured 14 species of ants, most of them commonly found in other studies. Species richness of arboreal ants decreased with increased tree/shrub density ($p = 0.05$) and plant cover ($p = 0.03$). The other variables did not correlate with ant richness. The increase in plant cover and density, which influence microclimate, besides quality and quantity of resources, could decrease the presence or exclude ant species typical of open spaces. The majority of ants of rupestrian fields are able to support high temperatures, low amount of water and organic matter. However they could not to be able to colonize sites with higher coverage or density. Therefore, in open habitats it is expected that ant richness is positively correlated with environmental variables related to temperature and luminosity.

FS05.P.03

Ant (Hymenoptera: Formicidae) fauna of Panga Ecological Station: richness, habitat preference and geographic distribution.

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Species lists may play an important role in preservation of a number of species and biodiversity as a whole, by providing a threshold for conservation. Based on this, this study aimed to generate a list of ant species and morphospecies located in Panga Ecological Station, determining their habitats preference and geographical distribution. For this, we used all ant data obtained at Panga station since 2003, comprising different sampling methods. Habitat types of each species and morphospecies were determined and, for those identified to species level, we compiled information on their geographical distribution. We recorded in total 310 ant species, in 403.85 hectares of sampling, representing 56 genera and 10 subfamilies. The species accumulation curve showed a clear tendency to stabilization, and the observed number of species represented between 77 to 99% of the estimated number of species (according to seven different richness estimators). Due to differences in the number of samples per physiognomy or stratum, we can’t say that there is a clear vertical stratification or a preference for forest or savanna habitats. The majority of ant species identified (71.5%) showed a wide distribution throughout the Neotropics. Alternatively, only 20 species (16.3%) had limited distribution only founded in South America, while 15 species (12.2%) had records only for Brazil. In addition, four species were recorded for the first time in Brazil. The high density of ant species recorded here demonstrates that Panga Ecological Station has a high potential as a reservoir of biodiversity. Moreover, the large number of species that remain unidentified gives us the extent on how ant fauna of the Brazilian Cerrado is poorly known taxonomically. For this reason we strongly encouraged a greater number of studies in order to increase the ant taxonomic knowledge in the neotropics as hole.

FS05.P.04

Immediate effects of interspecific competition on ant assemblages: an exclusion experiment of two dominant species contrasting Australia and Brazil

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Competition is a controversial theme in ecology. Studies involving competition and ants have demonstrated contradictories results. Thus, experimental work is necessary to elucidate the real importance of competition on ant communities. The aim of this study was to experimentally determinate the immediate effects of exclusion of dominant ants on the structure of ant communities. We collected data in Darwin, NT, Australia and in Uberlândia, MG, Brazil. We established one plot in each country (in woodland savanna areas) where we removed the two most dominant ant species (Iridomymex reburrus and Pheidole oxyops, respectively). The plots contained 100 sardine baits spaced 3 m from each other. The experiment was divided into three parts of three days each one. The first part was called ?before exclusion?, when the ants were collected without previous interference. In the second part, ?during exclusion?, the two dominant ants were blocked inside their nests with plastic bowls. Finally, in the ?after exclusion?, we unblocked the nests and the dominant ants were set free to forage. One hour after the baits were set, we determined the abundance and species of ants in each bait. Our results indicate that in Australia there was an increase of 50% in species richness and in overall ant abundance after the exclusion of I. reburrus. Furthermore, the composition of ant species on baits changed after the exclusion of dominant I. reburrus. In contrast, in Brazil there was a decrease in ant diversity after P. oxyops was removed and this pattern did not change after P. oxyops nests were unblocked. Furthermore, species composition did not differ among treatments in Brazil. These results indicate that the effects of interspecific competition can be idiosyncratic and differ strongly between the savannas of Brazil and Australia.

FS05.P.05

Canopy ant fauna along a natural succession gradient of Tropical Montane Forest

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Formicidae is one of the most representative groups of arthropods in forest canopies. We tested the hypothesis that advanced areas in succession have greater ant abundance and richness, which are negatively affected by the dry season, and also tested whether ant species composition differ among areas at different successional stages. We collected canopy ants of the Parque Estadual do Itacolomi, Brazil, in rainy and dry seasons from 2008 to 2011, in three areas in different successional stage. Eight groups of five to ten trees per area were sampled using sardine-honey baits, which remain available to ants for one hour. The areas showed different abundance and richness of ants only in the rainy season. The late successional area presents higher values successively followed by the intermediate and initial stages (ANOVA season*area: Abundance:$F_{2,40}$=5,20; p=0.013; Richness:$F_{2,40}$=5,31, p=0.009). Late and intermediate successional areas present reduction in richness and abundance in dry season, resembling the initial forest, which not varies between seasons. Late and initial areas present different species composition in the both seasons (Rainy season:R=0.26; p=0.02. Dry season:R=0,36; p=0.02), but not any is distinguishable from intermediate area. The intermediate area is the only one that change its ant species composition between seasons (R=0.17; p=0.02). *Solenopsis* sp1 is the most important specie for areas distinction, being more frequent at late successional area. *Pheidole* sp20 also contribute to discrimination. These species are more frequent at the same areas, and it is worth noting that *Pheidole* sp20 is more frequent at baits in dry season, just when *Solenopsis* sp1 present frequence reduction. The same pattern of change in frequence as season change is presented by *Linepithema* sp2 and *Crematogaster* sp6 in initial area. Data suggest the existence of a dynamic, strongly season-affected, ant territory mosaic in this community. (The study was supported by CAPES/PROF, CNPq and FAPEMIG).

FS05.P.06

Correlates of ant species richness and composition in natural remnants of semideciduos forest in Central Brazil.

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The Brazilian Cerrado is a biodiversity hotspot that is characterized as a mosaic vegetation types, including savannas of variable structure (the dominant vegetation), grasslands, and forests. Semi-deciduous forests are considered an important vegetation type inserted in the Cerrado because they contains many tree species from two other major South American biomes, the Atlantic Forest and the Amazon. Semi-deciduous forests are highly threatened because of the expansion and intensification of agriculture in the Cerrado. Several studies have been conducted concerning the floristic composition of semi-deciduous forests, but little is known about the fauna of these areas. Here we present information about the structure of ant assemblages in 10 remnants of semi-deciduous forest located in the Triângulo Mineiro region of Central Brazil. Ants were collected using sardine baits, pitfall traps and leaf-litter samples. For each remnant the following predictor variables were measured: remnant area, density of the arboreal vegetation, litter depth, soil P and N concentrations, and degree of human disturbance. So far, we recorded 143 ant species from 33 genera, of which *Camponotus* and *Pheidole* were the most frequent and diverse. The analysis showed that species richness was affected only by litter depth, whereas differences in species composition were better explained by variations in remnant area, tree density, degree of human disturbance, and soil nutrients. The observed, high turnover of species among the existing forest remnants suggest that conservation of the associated ant fauna will require a network of reserves.

FS05.P.07

Initial responses of ant-fauna of Montane Forests to the passage of fire.

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The equilibrium of terrestrial ecosystems are affected by different types of disturbance, including burning. The aim of this study was to follow the succession of the ant fauna, comparing richness, abundance and species composition of ants in two areas of Montane Forest (burned and unburned) during the first months after passage of fire. In October 2010, four months after the fire, a grid of 20m x 25m was plotted in each areas. Twenty pitfalls were placed 5m spaced from each other in each grid. The pitfall had 30ml and 5cm diameter. Pitfall traps was disposed and remained active for 96 hours. Samples were collected in October and December 2010, and February 2011.We identified 380 individuals from 18 genera belonging to six subfamilies: Dolichoderinae, Ectatomminae, Formicinae, Heteroponerinae, Myrmicinae and Ponerinae. Morphospecies of *Pheidole* and *Camponotus* were the most abundant. The burned area had the highest abundance of ants, but equalized to the control area in the last sampling (ANOVA: area*month: $F_{2,18}$=4,46, p=0,027). *Camponotus* and *Pheidole* were numerically abundant only in the burned area, but equalized the rest of the fauna at the end (ANOVA: area*months*species group: $F_{2,36}$ =7,14; p=0,002). The estimated richness was higher in burned area, then lower and finally equaled control area which remained constant throughout the period (Jackniffe I). Our results support the general pattern that groups like the ants area resilient to fire and respond particularly to the impact of it. But despite the rapid return of the values of abundance and richness, species composition is different (ANOSIM: R=0,33; p<0.001; NMDS Stress: 0,24). Due to this high resilience, ants can perform basic ecological functions at the beginning of the successional process, when there is high loss of diversity, and help to recover the equilibrium of the ecosystem after large disturbances.Acknowledgments: FAPEMIG and UFOP.

FS05.P.08

Elaiosome traits influence the diaspore removal by keystone mutualist ants in the Caatinga vegetation

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Myrmecochory was always considered a diffuse interaction as seed removal may be done by several ant species attracted to elaiosome-bearing seeds. However, some ant species may be considered more efficient dispersers (i.e.transport seeds to longer distances and/or discard them less grouped in nest refuses)and understand which elaisome traits attract these ants help us to predict which plant species will profit better from myrmecochory. We hypothesized that elaiosome/diaspore fresh biomass proportion, elaiosome lipid content and/or oleic acid content might be responsible for the diaspore attractiveness to high quality disperser ants. We measured interspecific variation in these elaiosome traits of five Euphorbiaceae species from Caatinga vegetation, NE Brazil. We established a 30-m transect and placed groups of three seeds on the ground at intervals of 10 m. We observed the seeds during 10 hours. We assigned ant behaviour toward diaspores into cleaning or removing. Total number of cleaning or removing observations was considered as a measure of diaspore attractiveness. Ants were classified as mutualist keystone ants and generalists according to their behavioral and morphological traits. Eleven ant species interacted with diaspore from Euphorbiaceae species in the study area; nine classified as generalists and two as keystone mutualist species. While generalist ants were observed more commonly cleaning seeds, keystone mutualist ants were always involved in seed removal. Additionally, generalist ants were equally attracted to elaiosome of all Euphorbiaceae species. However, keystone mutualist ants interacted more frequently with diaspores with higher elaiosome/diaspore fresh biomass proportion. In myrmecochorous diaspores, the seeds are an extra load for the mutualist keystone ants. Therefore, selecting diaspores with higher elaiosome/diaspore fresh biomass proportion may maximize the net energy gain of ants during foraging activity. The benefits provided by these ant species may vary among plant species and these benefits should drive the evolution of elaiosome traits.

FS05.P.09

Interactions between ants and non-myrmecochorous fruits in species of *Miconia* (Melastomataceae) in a Neotropical savanna

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The aim of this study was to evaluate the role of ants as secondary seed dispersers of six primarily bird-dispersed *Miconia* species in the Cerrados of southeastern Brazil. Vertebrate exclosure and seed germination experiments were performed for *M. albicans*, *M. alborufescens*, *M. corallina*, *M. ferruginata*, *M. ibaguensis* and *M. irwinii*. Excluding vertebrates did not significantly alter fruit removal rate for any of the *Miconia* species relative to open controls. Fruits on stalks and fallen fruits were removed and transported to nests mainly by species of *Atta*, *Acromyrmex*, and *Ectatomma* (dispersal distance ranging from 0.1 to 45.2m), while *Camponotus* ants tended to be observed removing the fruit pulp (seed cleaning) where the fruits were found. Seed manipulation by *Atta* decreased germination of *M. irwinii* but not *M. ferruginata*. Germination did not occur in intact fruits, and thus seed cleaning was an important service provided by the ants. Ant nest soils did not inhibit germination of any of the *Miconia* species, suggesting they are a good substrate for long-lived *Miconia* seeds. We conclude that ant activity could have important effects on the fate of *Miconia* seeds adapted for bird dispersal.

FS05.P.10

EFFECT OF ENVIRONMENTAL COMPLEXITY ON FOOD DISCOVERY BY ANTS

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The replacement of natural formations by monoculture changes the structural complexity of habitats and several studies have shown the predominance of negative effects on ant communities associated. The objective of this study was to test the hypothesis of the positive effect of environmental complexity on food discovery exerted by ants. The study was conducted at two natural formations, Mata Alta and Mussununga, and a reforestation of *Eucalyptus sp*. In Linhares, Espírito Santo state, Brazil. Two baits (honey and sardines), ten centimeters away from each other, were placed in each of the fifteen randomly selected points per habitat. In each point height of the litter and dry weight, number of leaves and branches were measured. Food discovery was measured by the time spent for the first ant to reach the bait, both for honey and sardines. To test the hypothesis proposed generalized linear models (GLMs) were built. The response variables used were food discovery and the measures of complexity of litter and the explanatory variables used were the measures of complexity of litter and the habitat. The height and biomass of litter are higher in reforestation ($p < 0.05$). The number of leaves and branches did not vary between the habitats ($p > 0.05$), indicating that the litter of natural formations undergo a degradation process more efficient when compared to reforestation. As expected, ants require a longer time to reach bait in reforestation and spend the same amount of time in the two natural formations ($p < 0.05$). With environmental homogenization, much of the fauna is lost and the environmental services provided by organisms belonging to different trophic levels are affected. In this study we observed that the ability of ants to find their prey is affected by these anthropogenic habitat modifications.

FS06.OC.01

Seed and fruit tradeoffs – the economics of seed packaging in Amazon pioneers

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The tradeoff between seed mass and seed number per tree has been widely established for different communities and is interpreted as a tradeoff between establishment and dispersal. Here, we analyze tradeoffs among seed and fruit traits of Amazon pioneer tree species as the economics of seed packaging. We hypothesized that seeds per fruit is the pivotal variable such that for a given fruit mass, more seeds per fruit implies lower seed mass which fosters greater seed number per tree. Similarly, for a given seed mass, more seeds per fruit implies greater fruit mass which is associated with lower fruit number per tree. We tested and generally confirmed these relationships for seed and fruit data from 12 species of pioneer trees from the Central Amazon. Notably, seed number was explained only partially by seed mass ($R^2 = 0.55$), but nearly completely by seed mass, fruit mass and fruit number ($R^2 = 0.94$). In addition, we measured seedling densities in light gaps and adults in secondary forests and then used regression analysis to determine if seedling and adult densities could be explained by seed packaging variables, by fruiting duration, or by germination rates. Seedling and adult densities were best explained by fruit number and fruit mass, not by seed number and seed mass. Fruit variables may be more predictive of seedling and adult densities than seed variables if dispersal is more limiting than establishment. The seed mass-seed number tradeoff in plants, generally interpreted as a tradeoff between dispersal and establishment, is only one component of the economics of seed packaging—i.e., how biomass is allocated among both seed and fruit traits across coexisting plant species.

FS06.OC.02

Contribution of pollen and seed dispersal to gene flow of an understory herb across a heterogeneous landscape.

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Gene flow is one of the most critical processes determining the genetic structure of plant populations, with seed dispersal primarily affecting spatial structure and pollination having important consequences for the maintenance of genetic diversity. Tropical landscapes are subject to pervasive anthropogenic modifications that may ultimately affect pollination and seed dispersal processes. However, little is known about how these human impacts influence gene dispersal via pollen and seed across modified tropical landscapes. We evaluated the contribution of pollen and seed dispersal to gene flow of the Amazonian plant *Heliconia acuminata* (Heliconiaceae), a common understory species pollinated and seed-dispersed by birds. The study was conducted in two continuous forest sites and three 1-ha fragments in the Biological Dynamics of Forest Fragments Project, Manaus, Brazil. We genotyped flowering plants and established seedlings between 1999 and 2009. We used a Bayesian approach to jointly estimate parentage and characterize pollen and seed dispersal kernels by making use of genetic data, spatial location and plant reproductive phenology. Contrary to the expectation that forest fragmentation disrupts gene flow, we found that average pollination and seed dispersal distances were higher in forest fragments than in continuous forest. Lower seed and pollen distance in the continuous forest appears to be the result of higher density of flowering plants. Pollinators and seed dispersers are likely to be using fragments and moving across the landscape bringing pollen and seeds from other remnants, continuous forest and regenerating vegetation. Given continuous and elevated local spatial availability of flowers and fruits, birds may concentrate foraging within smaller areas generating a more distance-limited dispersal in continuous forest sites. In conclusion, gene flow is potentially enhanced in forest fragments indicating that behavior of pollinators and seed dispersers change across a heterogeneous landscape due to configuration of habitats and the spatial and temporal availability of food resources.

FS06.OC.03

Anthropogenic disturbance reduce seed dispersal quality of myrmecochorous plants in the Brazilian Caatinga

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Human activities may affect biotic interactions and ecosystems services, such as seed dispersal. This interaction type normally involves a big number of dispersal agents which provide different benefits to the plants. High quality dispersers are normally those ones more specialized and therefore they may be more susceptible to environmental changes. We hypothesized that seed dispersal by ants will be negatively affected by human disturbance, and that high quality disperser ants will be more affected than generalist ones. We offered seeds from two myrmecochorous species, in 24 0.1-ha plots in a gradient of anthropogenic disturbance in a Caatinga vegetation area, Northeastern Brazil. In each plot, we established two 50 m transects, apart 20 m from each other. Along transects, we placed 50 seeds of each species, in groups of ten, at 10 m intervals. During 10 hours we observed the ant species attracted to seeds, the number of seeds removed by ants, and the displacement distance. We classified ants as high quality disperser or generalist according to literature description. To measure the anthropogenic disturbance degree for each plot, we used the sum of three environmental variables: distance to the nearest urban core, rural property and road. For both plant species the number of removed seeds and the seed displacement distance were negatively related to human disturbance. The number of seeds removed by high quality disperser ants was negatively related to anthropogenic disturbance. On the other hand, the number of seed removed by generalist ants was not affected by disturbance. We demonstrated that anthropogenic disturbance reduce the interaction between high quality disperser ants and myrmecochorous seeds. These findings indicate that the quality of dispersal services provided by ants is reduced in more disturbed areas. Therefore, the seed germination and seedling establishment of myrmecochory species may be negatively affected in these places.

FS06.OC.04

Farming the forest: positive feedbacks between food plants, hornbill abundance and seed arrival

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Food plant species distribution and abundance can influence frugivore abundance which in turn can influence the spatial patterns of seeds dispersed by the frugivores. Amongst avian frugivores, hornbills are one of the important dispersers in tropical forests of Asia. This study aimed to test whether 1) areas with higher fruit abundance/richness attract greater numbers of hornbills and 2) whether areas with high hornbill abundance experience higher scatter-dispersed seed rain of select large-seeded plants?

The study was carried out in Namdapha Tiger Reserve in north-east India. Fruit tree watches helped determine the main dispersers of select large-seeded plants. Eight trails (1.5 km) were monitored for hornbill abundance from November 2010 – March 2012. Density and food plant species richness was calculated using belt transects (1500 × 20 m^2) along the length of each trail. 1600 1 m^2 plots were laid to estimate scatter-dispersed seed arrival along each trail. Data for the year 2010-11 has been analyzed. Analysis for 2011–12 data is in progress.

The three hornbill species differed in their dietary preferences. Great hornbills preferred figs over non-figs while the Wreathed and Rufous-necked Hornbills preferred large-seeded non-fig fruits. Food plant species richness and food plant density explained the variation in abundances of Wreathed (F = 7.194; Adj. R^2 = 0.47; p = 0.04) and Great hornbill (F = 9.188; Adj. R^2 = 0.56; p = 0.02) respectively. Combined encounter rates of Rufous-necked and Wreathed Hornbills explained the variation in scatter-dispersed seed arrival of select large-seeded plant species in the study area (F = 8.39; Adj. R^2 = 0.51; p = 0.03).

Thus, different hornbill species though belonging to the same guild could play a varying role in influencing the spatial distribution of seeds. Frugivore abundance influenced by food plant density and diversity could significantly influence the spatial distribution of scatter-dispersed seeds.

FS06.OC.05

ECOLOGY OF SEED DISPERSAL OF THE PALM Oenocarpus bataua IN A FOREST OF THE EASTERN LOWLANDS IN COLOMBIA.

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Oenocarpus bataua is a palm distributed in tropical South America, it has great ecological importance as food source for wildlife because of its abundant production of fruit and protein and lipid quality of these. However, the future of their populations may be affected by the loss of seed dispersers such as medium- and large-sized birds and mammals. The objectives of this study were to identify the frugivore assemblage of *O. bataua* and determine the seed removal distances. To register frugivores we used camera-traps (6663 hours), they were set pointing to infructescences and groups of fruit on the forest floor. We also marked 965 fruits were randomly placed on the ground and after several days we recorded removal distances. Seven mammal species were identified visiting the fruits on the ground, which *Dasyprocta punctata* was the species that had higher consumption, followed by *Nasua nasua* and finally *Didelphis* sp. Although it didn't obtain photographic record of animals visiting the infructescences, by direct observations we identified primate *Cebus apella* consuming the fruits. Only 170 fruits were removed from ground, of which 23% were lost (ie, were more than 10m away), the rest had distances between 0,1m and 10m, the most common distances were in the range 0 to 3m. Frugivores that disperse seeds of *O. bataua* may be contributing to the regeneration of this palm, which produces a large quantity of fruits that accumulate under the parent tree. Thus, dispersers play a role in reducing density-dependent mortality, contribute to gene flow and colonization of new areas.

FS06.OC.06

Seedling assemblages and alternative successional trajectories in a fragmented landscape of tropical forest

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Alarming rates of habitat loss and fragmentation have augmented the interest regarding the forces controlling forest regeneration and dynamic in human-modified landscapes. We examined tree seedling and adult assemblages across forest fragments and stands of mature-forest to infer about successional trajectories experienced by edge-affected habitats in the Atlantic forest. The study was carried out in an aging and fragmented landscape in northeast Brazil, from which we contrasted a series of small forest fragments (3-91 ha) to mature-forest stands located in the largest (ca. 3500 ha) and best-preserved forest remnant in the entire region. Seedling assemblages inhabiting small forest fragments exhibited reduced species richness (up to 50%) in comparison to seedling assemblages in the mature-forest and adult assemblages in both small forest fragments and mature-forest stands. Moreover, NMDS ordinations clearly segregated fragment seedling assemblages in both taxonomic and functional terms. Briefly, seedlings of pioneer species and those bearing medium-sized seeds (0.6 – 1.5 cm) increased in small fragments, while large-seeded species (1.6 – 3.0 cm) were reduced by more than a half. The replacement of the old-growth flora by pioneers was also confirmed by an indicator species analysis and the resulting pioneer indicators. Our results suggest that small forest fragments support largely simplified and distorted seedling assemblages as pioneers replace the old-growth flora, a sort of floristic/functional drift that potentially alters forest successional trajectory across edge-affected habitats.

FS06.P.01

Presence of ambrosia beetles in mistletoe seeds: pre- or post-dispersal seed predation?

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Mistletoes are aerial hemiparasite plants that function as keystone resources in many ecosystems worldwide. Mistletoes maintain a broad number of interactions with diverse groups of animals. However, information of mistletoe-insects interactions is very scarce. In this study, we investigated seed predation of the mistletoe*Psittacanhus plagiophyllus* by ambrosia beetles in a savanna-land of northern Brazil (Santarém, Pará). Our aim was to determine if such predation is a pre-seed dispersal process (i.e. occurs while mistletoe seeds still remain inside the fruits), or a post-seed dispersal process (i.e. occurs once birds have deposited seeds on host branches). We compared the proportion of non-dispersed and dispersed seeds with clear evidences of beetle presence. Non-dispersed seeds were collected from ripen fruits of 26 mistletoe shrubs growing on different host trees, whereas dispersed seeds were collected from branches of the same 26 hosts. We left all collected seeds desiccating in a common garden close to the study site waiting for beetle development. Non-dispersed seeds were planted on dead branches of *Anacardium occidentale* (cashew tree), which is the only known host of this mistletoe in our study site, while dispersed seeds were kept on cork recipients until they got grayish. All seeds were hand opened and checked for presence of eggs, larvae, adults or holes left by beetles. The beetle was identified as *Hypothenemus* sp. (Family Scolytidae). We found that 15.4% of mistletoe seeds dispersed were predated (mean±SD=15.6±13.9), while non-dispersed seeds remained nearly intact (2 seeds of 271). This study provides the first documentation of seed predation of mistletoe seeds by a seed borer beetle, and concludes that this is a post-dispersal seed predation process with a great potential to influence population dynamics of *P. plagiophyllus*

FS06.P.02

Microhabitat niche differentiation driven by germination traits and seed dispersal modes contributes to the maintenance of Neotropical high diversity communities

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Ecological and evolutionary correlates with seed and germination traits can determine species ranges and community diversity. Surprisingly, their importance in structuring Neotropical vegetation is unknown. Here, we studied the germination requirements of 50 sympatric species of Melastomataceae differing in geographic range (widespread vs. endemic), microhabitat preference (xeric vs. mesic sites) and dispersal modes (biotic vs. abiotic) in the seasonal and fire-prone savannah vegetation (highland Cerrado) in southeastern Brazil. We tested whether germination requirements to variation in light and temperature were more related to geographic range or microhabitat preferences. We observed a congruent pattern of distinctive germination responses in species from xeric vs. mesic habitats to variation in temperature but not in light. Species inhabiting xeric habitats showed significantly lower temperature ranges compared to plants from mesic sites. Interestingly, this pattern was phylogenetically conserved within the Miconiae clade. Besides, interspecific variation was not associated with geographic distribution. These results were further supported by multivariate analyses, which clustered species differing in dispersal mode and microhabitat preference, but not in geographic range. Our results suggest, first that plants from different functional groups experience opposing selective pressures and, second, that seed size plays an important role in the evolution of germination traits and the maintenance of diversity in high diversity Neotropical communities. The evolution of accurate mechanisms for temperature and light sensing are important determinants of the regeneration niche, with phylogeny also influencing functional traits and thus niche differentiation. This study provides support for the importance of the regeneration phase determining plant distribution at local, but not at continental scales. Divergences in germination traits in species from different microhabitats and dispersal modes provide a mechanistic explanation for how spatial heterogeneity maintains coexistence in patchy, species-rich tropical plant communities.

FS06.P.03

DISPERSION SYNDROMES AND LIFE FORMS OF HERBACEOUS SPECIES AS TOOLS FOR THE EVALUATION OF RESILIENCE IN DRY FOREST AREAS

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The dry areas existing in the semi-arid region of the Brazilian Northeast present a strong biodiversity, which is still scarcely known. The dispersion of fruit and seeds is a form to ensure the conservation of vegetal species, allowing for the recruiting of new plants. Bearing this in mind, the objective of this paper was to study the dispersion of seeds and the forms of life of the species present in a Caatinga area. The study was carried out in a degraded area of 0.5ha (09°19'43,47"S 040°32'53,39"W, 370m alt.), located in the campus of the Federal University of Vale do São Francisco (UNIVASF), Petrolina, Pernambuco. All the fertile species were collected, herborized and incorporated to the property of the Herbarium Vale do São Francisco (HVASF). The identification of the species, dispersion syndromes and life forms was made with the help of specialists, as well as consulting literature. From the 58 species collected, 53.4% present autochorous dispersion; 41.4% anemochorous dispersion; and 5.2% zoochorous dispersion. As for the life forms, the therophytes were the most representative ones (70.7%), followed by camephytes (17.3%), hemicryptophytes (5.2%), microphanerophytes (3.4%), nanophanerophytes and e mesophanerophytes (1.7%). The higher representativity of the authocorous and anemochorous dispersion syndromes suggest a low representativity of dispersers in the environment studied, certainly due to the absence of attractive conditions for them, such as the lack of sites for landing and shelter and the low availability of food, among others. The high presence of therophytes suggest that the site, in spite of being free from impacts for 10 years, has hardly advanced successionally, demonstrating that some levels of impact may hinder the resilience of dry forests, making human intervention necessary for its restoration.

Keywords: Conservation, Caatinga, Restoration.

FS06.P.04

***Attalea phalerata* inhibits seedling establishment?**

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Studies have shown that palm trees can reduce the richness and abundance of plants under their canopy, acting as a barrier for seedling establishment. Our goal was to determine whether the palm tree *Attalea phalerata* reduces the establishment of seedlings in the Private Reserve of Natural Heritage Engenheiro Eliezer Batista (18º05'19 "S, 57º28'30" W), Amolar mountain range, Mato Grosso do Sul. We sampled 20 adult individuals of *A. phalerata*. Under each plant we established two oppositely arranged 1 m^2 plots and quantified richness and abundance of seedlings smaller than 1 m. Two 1 m^2 plots, established two to five meters away from the projected palm canopy, were used as control areas. As expected, seedling abundance under the palm was about 2.5-fold smaller than that of control areas (7.3 ± 3.5 vs. 17.6 ± 7.9 seedlings/2 m^2). Similarly, seedling species richness was clearly reduced under the canopy of palm trees, from 5.7 ± 1.5 in control areas to 3.6 ± 1.2 species/2 m^2 under the palm. Our results support the general hypothesis that palm trees may represent unsafe sites for plant recruitment. Several mechanisms may underlie this inhibition process: (1) seed may fail to arrive on the soil owing to the complexity and closure of palm canopy, (2) arrived seeds may fail to germinate due to reduced light incidence under the palm canopy, and (3) seedling growth and development may be inhibited by the light limitation. Ultimately, this inhibition process may also contribute for the monodominance of *A. phalerata* in our study area.

FS06.P.05

Influence of anthropogenic disturbance on seedling establishment in nests of a keystone mutualist ant int the Caatinga vegetation

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One of the benefits of myrmecochory is the direct dispersal, which is the seed removal and deposition in a rich environment that facilitates seed germination and establishment, the ant nest. But the direct dispersal 'service' may vary according to the ant species involved in the interaction. For example, species dispersing seeds farther and faster and depositing them less grouped in nest areas provide a better 'dispersal service' and are considered key stone mutualist. However, anthropogenic disturbances (e.g. logging, hunting, fire, and conversion of natural areas in plantations and pastures) may affect the abundance and the behavior of mutualist ants, changing the output of this ant-plant interaction. The aim of this study was to investigate the role of *Dinoponera quadriceps* Santschi (Hymenoptera: Formicidae) as a keystone seed disperser in the Caatinga, favoring seedling establishment, and to verify the influence of human disturbances in this ant-plant interactions. The work was done in 24 0.1 ha plots distributed along an anthropogenic disturbance gradient combining several disturbance metrics (i.e. distances to the nearest road, the nearest rural village and the nearest urban center). All nests in the plots were quantified and seedlings in the nest mound and in a control area without nest influence (10 m from nest) were counted. We found 86 nests of *D. quadriceps*. Nest areas showed twice higher seedling establishment than control area, which indicates that *Dinoponera* ants promote seedling establishment, acting as a keystone seed-disperser in Caatinga. However, there were no differences in the number of individuals and species through the disturbance gradient. This result might be related with the fact that seedling establishment in Caatinga are mostly related to humidity, and the nest area are normally more humid than soils not affected by ants, compensating the draught that may be caused by desiccating microclimate conditions of disturbed areas.

FS06.P.06

Differential contribution of frugivores to seedling recruitment and the influence of microsite preference

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Seed dispersal mutualisms between frugivores and plants are often complex and involve a network of multiple interacting species. We know little about how frugivores within a dispersal guild differ in their roles and efficacy as dispersers. Understanding the level of functional redundancy in disperser communities is important for understanding how these systems work and how an ecosystem might respond to the loss of individual dispersers. This is particularly important in the face of increasing loss of large-bodied frugivores worldwide. While most seed dispersal studies focus on the early stages of seed dispersal and germination of ingested vs. non-ingested seeds, it is important to also link seed dispersal activity with fate of seed rain reaching specific microsites which may be important for seedling recruitment. This study uses observations and post-dispersal germination experiments to examine how three frugivorous lemurs from Madagascar's southeastern rainforest differ in their effect on common host-plant species based on microsite deposition patterns. Our results demonstrate that one lemur species held a significantly greater positive impact on host plant recruitment by preferentially carrying seeds into open microhabitats where seedling recruitment is high. All three lemurs deposited seeds preferentially away from conspecifics and in areas with <75% canopy cover. Understanding the relative effects of sympatric mutualists helps us understand which interactions are at greater risk for the loss of a critical partner. This is especially crucial in areas such as Madagascar where lemurs face critical threats of extinction from deforestation, habitat degradation and hunting.

FS06.P.07

Survival and growth in response to prolonged submersion in tree seedlings of flooded Amazonian forests

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The Central Amazonian floodplain forests are subjected to extended periods of flooding. Under these conditions seedlings may remain submerged in the dark for long periods of time. The aim of this study was to evaluate the effect of long-term submergence on survival, leaf phenology and growth of seedlings of *Crataeva benthamii* Eichler, *Eugenia inundata* DC., *Genipa americana* L., *Simaba guianensis* Aubl, which are common in the flooded forests of the Amazonian region. Ten potted five- month-old seedlings of each species were kept submerged for 90 days in the dark. Controls were kept at field capacity and 90% of shading. All seedlings survived the 90-day period of submersion. However, they stopped growing, while control seedlings exhibited continuing growth and produced new leaves. The four species differed in their patterns of leaf shedding in response to submergence. *Crataeva* exhibited rapid leaf loss. Following submergence, all plants were leafless within five days. Genipa and *Simaba* exhibited gradual leaf loss. The leaves became yellow before the release, suggesting nutrient retranslocation. Total leaf fall in *Simaba* occurred only after 25 days of submergence. Some *Genipa* seedlings still maintained one to two leaves after 90 days of submergence. In contrast, submergence did not induce leaf fall in *Eugenia* seedlings. They retained their leaves which remained green throughout the 90 days of submergence. In conclusion, all four species were able to withstand long periods of submersion despite of light deprivation and hypoxic conditions, and to reduce their use of storage reserves by curtailing stem growth and leaf production. CNPq, CAPES, DPP-UNB.

Key words: flood tolerance, hypoxia, water stress

FS06.P.08

Germination and seedling development under water of nine tree species from Central Amazonian floodplains

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Trees in the Central Amazonian floodplain forests are submitted annually to long periods of submersion and hypoxic conditions, particularly in the lower parts of the floodplains. The ability of these plants to colonize these environments depends on their germination and seedling establishment strategies. The objective of this study was to assess germination potential and seedling formation of nine tree species subjected to two treatments: submerged and non-submerged. The species were: *Albizia subdimidiata, Laetia corymbulosa, Pouteria glomerata, Crataeva benthamii, Genipa americana, Eugenia* sp., *Simaba guianensis, Pseudobombax Munguba* and *Parkia discolor*. Germination occurred in chambers at 28 ° C, under a photoperiod of 12 hours. Seeds were placed in gerbox (4 replicates of 25 seeds) containing 340 mL distilled water (submerged) and in Petri dishes on filter paper (non-submerged). After germination (radicle protrusion ~ 1.5 cm) they were transferred to plastic pots with lids, containing 500 mL of distilled water (submerged) or to plastic cups (300 mL) containing commercial Bioplant substrate (non-submerged). Germination percentage and mean germination time (MGT) were calculated and seedling development was followed. Most species had seeds germinating under water, with the exception of *P. discolor*. Of these, only *S. guianensis* showed a significant difference (p£0.05) between treatments (40% submerged, 93% non-submerged). Flooding did not increase (p>0.05) MGT (submerged: 39.85 days, non-submerged: 38 days). All species that germinated produced healthy seedlings when submerged (48%), but it was significantly lower (p£0.05) than the number of seedlings produced under non-submerged (68%) conditions. However, all seedlings survived when they were transplanted to Bioplant substrate, after producing the first pair of leaves under water. This ability to germinate and to produce a seedling while flooded, may reduce the establishment period during the short terrestrial phase that characterize the lowermost parts of the floodplains.
Capes-CNPq

FS06.P.09

Are all fruits the same? Fruit lipids and fruit choice by birds

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Fruit choice by frugivorous animals has been a topic of interest for seed dispersal ecologists for a long time. Fruit choice has the potential to influence not only fruit selection *per se*, but the coevolution between plants and frugivores. Here we explore the hypothesis that birds pertaining to a mostly insectivorous lineage usually interact with lipid-rich fruits, while birds from predominantly frugivores or omnivores clades usually interact with carbohydrate-rich fruits. The mechanism behind this reasoning has to do with the digestive physiology of birds. The digestion of lipids demands certain metabolic pathways that are present in insectivorous birds but not in frugivores or omnivores ones. We searched the Brazilian literature for studies reporting the chemical contents of wild fruits and studies reporting the consumption of wild fruits by birds. We got the lipid content of 275 fruit species, which were heuristically divided in lipid-rich (pulp > 30% lipids in a dry mass basis), and lipid-poor ones (< 10% lipids). We found 55 studies on bird frugivory involving > 120 plant species, 218 bird species, and 29,298 feeding visits to fruiting plants. Based on the diets of birds, we divided the bird families recorded in the surveyed studies into those predominantly insectivorous or predominantly frugivorous/omnivorous. We then compared the number of feeding visits made by these two groups of bird families to fruiting plants. Results showed that indeed predominantly insectivorous families visited more frequently plants with lipid-rich fruits than predominantly frugivorous/omnivorous, whereas the opposite was true for plants with lipid-poor fruits. Our results suggest that an evolutionary insectivory history seems to predispose birds to consume lipid-rich fruits.

FS06.P.10

ISOLATED NATIVE TREES IN TROPICAL PASTURES: CENTER OF ARRIVAL OF SEEDS

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The forest fragmentation has conditioned the regional landscape of Southeastern Brazil to small and isolated seasonal semideciduous forest fragments with low connectivity, due to urban, agricultural crops and pastures. In this mosaic we frequently find isolated native trees at different distances from forest fragments, which potentially act as nuclei for both seed and diaspores arrival. We aimed to answer if the level of isolation of trees in tropical pastures interferes in the composition of seed rain. We sampled randomly 18 seed traps (1.0 m^2) under trees canopies (2.0 m above the ground). We allocated them at different distances from the adjacents forest fragments. We collected seeds every two weeks during the rainy season. We counted them and categorized them in morphospecies. We found a total of 25 morphospecies, and a supply of seeds quite similar between collectors, regardless the distance of trees in relation to the forest fragments. On average, each trap contributed to the input of three species of seed and the difference between the numbers of seeds may varied according to the species diversity of the nearest fragment. So, we inferred that a high level of disturbances and also low species diversity in all forests communities considered could have influenced seeds arrival. Abundance was not related to the degree of isolation of such trees, but could be directly related to the floristic composition of the adjacent forests. In this sense, we argued about the importance of maintaining these small forest fragments, promoting ecological restoration practices that could increase their connectivity. In this scenario, isolated trees may provide a link between disconnected fragments, is therefore necessary to establish the role of these isolated trees as the center of arrival of seeds, independent of their spatial location, and their participation in increasing the connectivity between fragments. FAPESP Process 2011/06782-5.

FS06.P.11

Seed predation and germination of *Peltogyne gracilipes* (Ducke) in three forest types on Maracá Island, Roraima, Brazil

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Seed predation of *Peltogyne gracilipes* was investigated in three forest types: Peltogyne-rich forest (PRF), Peltogyne-poor forest (PPF) and Forest without *Peltogyne* (FWP). Seed experiment were performed in 12 plots of 40m x 250m of the Biodiversity Research Program (PPBio) installed in the eastern portion of Maraca Island, four plots per forest type. In each plot, groups of 30 seeds (n= 4) were randomly arranged. All seeds were marked with permanent ink so that they were recognized during the evaluation. After ten days, the number of seeds predated (seeds removed and/or attacked by insects) was assessed. Furthermore, we observed that some seeds that remained and suffered no attack were germinating and it also was recorded. Results were analyzed by ANOVA (single factor) and compared by Tukey test (α=0.05). The mean (± standard deviation) and percentage of predated seeds were respectively 14 (±1.22); 12% (PRF), 101 (±1.5); 84% (PPF) and 27.25 (±7.59); 23% (FWP), so the highest seed predation occurred in PPF (P<0,0002; n=4). *P. gracilipes* seeds in general were predated by leaf-cutter ants (*Atta cephalotes* and T*rachymyrmex* sp.*)* and beetles (Curculionidae and Nitidulidae). The mean (± standard deviation) and percentage of germination in relation the number of non attacked seeds were 79.75(±10.47); 75% (PRF), 13.75 (±2.60); 72% (PPF) and 6.25 (±3.11); 7% (FWP). Germination in FWP was lower than in the other two forests (p<0.001). As the germination rates were similar in PRF and PPF, seed predation seems to be a key factor to explain the great success in seedling recruitment of *Peltogyne* in PRF than PPF. In FWP, seed predation was not the main factor that inhibited recruitment of *Peltogyne* seedlings, other factors such as soil conditions and/or light should be involved.

FS06.P.12

CONSUMPTION OF FRUITS BY BIRDS IN TROPICAL DRY FOREST, SOUTHEASTERN BRAZIL

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The analysis of diets can help to understand several ecological interactions, such as fruit-dispersers relationships. The studies by animals that consume fruits are very importance, because they can show which species were acting in process of environmental restoration by dispersal seeds. Birds stand out among animals due a high diversity of seed dispersers' species. In Tropical Dry Forests (TDF), information about the fruit-eating by bird is outdated and therefore requires further studies. We evaluated which TDF birds' species eat fruits and which of these species can participate effectively in environmental regeneration by seed dispersal. The study was carried out in a TDF site in southeastern Brazil (14°97'02"S- 43°97'02"W e 14°53'08"S-44°00'05"W) from April 2009 to December 2010. Mist nets were used for capturing the birds, with total trapping effort of 6480 net-hours. The consumption of fruit was evaluated by analysis of the diet obtained by the method of induced regurgitation. We captured a total of 76 bird species, with 18 species related to seed and/or fruit pulp consumption. Eleven different kinds of seeds were consumed by birds' species, which the *Commiphora leptophloeos* was the most eaten. The bird specie with more consumption of fruits was *Myiopagis viridicata*. This species occurred in high population concentration since the early stages of regeneration even in primary forest. These characteristics can indicates that *M. viridicata* are acting as disperser of seeds in secondary succession, because would be carry seeds from primary forest to disturbed areas. We conclude that significant part of TDF birds' species consumed fruits, in which 24% of species eaten fruit. We also stands out the *M. viridicata* specie, which can be a important species in the studies of environmental restoration.

FS06.P.13

Concentration of resources and attack of bruchineos in seeds of *Acrocomia aculeata* (Arecacea) in the Minas Gerais Cerrado

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Specialist herbivores should be able to find, efficiently, their host plants both in space and time. Thus, the concentration of resource is an important factor that determines the selection of host plants. The objective of this study was to test the "Resource Concentration Hypothesis" predicts that: a) plants with a larger number of fruits under the canopy are most attacked b) populations of *A. aculeta* with higher density of plants are most attacked. We sampled 10 populations of the plant distributed by portions north, central and western Minas Gerais State. In each population were selected 10 adult individuals of *A. aculeata* far between 50 meters. In each plant, all seeds on the soil were collected in four plots of 0.5m X 0.5m distant 0.5m, 1.0m, 1.5m and 2.0m respectively from the mother-plant. The density was obtained by determining the number of individuals of *A. aculeata* in a radius of 10m of the plant sampled. The collected seeds were open in order to define the attack. We collected a total of 2.890 fruits in the populations sampled, 1.780 of these were predated. The rate of predation ranged from a minimum of 42% in the population Arapuá to a maximum of 85% in the population Florestal. The increase in the number of fruits decreases the rate predation ($p<0.05$) refuting the prediction (a). However, more dense populations increase the probability of meeting of the fruit by predator ($p<0.05$), as described in the prediction (b). An increased density of fruit on an individual scale, can exceed the consumption capacity of the predator, decreasing the probability of the fruit be preyed. This justifies the grouped standard displayed by populations of *A. aculeata*. In the other hand, higher densities of plants would support a larger predator population, which explains the large variation in attack rates.

FS06.P.14

A Comparative Study of Germination Responses of Semiarid Sandy Coastal Plain Plants to Different Temperature and Water Regimes

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Arid and semiarid environments are defined as highly heterogeneous with low and irregular rainfall, high levels of irradiance and substrate temperatures. In these regions with a typically patch plant cover, the micro-environmental conditions underneath shrubs and open spaces are different. Since (*i*) environmental conditions between these two microsites are different, and (*ii*) plants select their habitats indirectly through the precise mechanisms of germination cueing to environmental conditions, we investigated whether the distinct germination responses are related to microsites where seeds were collected (patches of vegetation or bare sand). To test this hypothesis, the effect of different temperature and water regimes on germination of eight species from the hot semiarid sandy coastal plain (restinga) in Brazil was analyzed. The shrub species only found on patches were *Clusia fluminensis* Planch. and Triana (Clusiaceae), *Erythroxylum ovalifolium* Peyr. (Erythroxylaceae), *Maytenus obtusifolia* Mart. (Celastraceae), and *Pilosocereus arrabidae* (Lem.) Byles & G.D. Rowley (Cactaceae). The herbaceous species only found on bare sand were *Chamaecrista ramosa* (Vogel) H. S. Irwin & R. C. Barneby (Fabaceae), *Chamaecrista flexuosa* L. (Greene) (Fabaceae), *Lagenocarpus rigidus* Nees (Cyperaceae), and *Melocactus violaceus* Pfeiff (Cactaceae). Germination of all species associated with patches of vegetation was more reduced at high temperatures, and at low water potentials that resemble the bare sand conditions. *M. obtusifolia* showed dissimilar germination behavior regarding the other three patchy species, as germinated in high alternating temperatures and in low water potentials. In contrast, high alternating temperatures decreased seed dormancy and promoted a high germination of *L. rigidus* and *M. violaceus*, both associated with bare sand. Seeds of all species from bare sand had dormancy that may permits a successful establishment, since in this microsite the environmental conditions are more variable and harsh. In conclusion, the distinct germination responses may influence the distribution pattern of the species studied in this vegetation.

FS06.P.15

High temperatures influence germination of four Fabaceae species in South Brazil

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It has been shown for different ecosystems that the passage of a fire breaks dormancy of the seeds of many plant species. This response to fire is especially well known for the Fabaceae family, but has been poorly studied in Southern Brazil. We collected seeds of four Fabaceae species present in grasslands of RS: *Mimosa bimucronata*, *Desmodium barbatum, Sesbania virgata* and *Collaea stenophylla*. Seeds were exposed to different heat treatments. For each treatment, we used 5 replicates of 25 seeds. Treatments were: 60° and 80° (both exposed during 5 minutes) and 100° C (exposure for 2 minutes). For all species, we used a control treatment without exposure to heat. After the treatment, the seeds were kept in a germination chamber with a light period of 12/12 hours and temperature of 25° C. Percentage of germinated seeds was counted every 2 days. The results were analyzed by Analysis of Variance with randomization testing (Euclidean distance, 1000 interactions). Two species (*Desmodium barbatum and Sesbania virgata)* increased germination when exposed to high temperatures (80° and 60° respectively), while one showed reduction (*Mimosa bimucronata)* and the last did not show any response to the treatments (*Collaea stenophylla*). Our study was the first for southern Brazil to show a positive response of germination to heat for grassland species. *Mimosa bimucronata* is a species that occurs not only in forest-grassland mosaics, but also in wetland; the reduced germination after temperatures between *80°* and 100° C could be related with this distribution in environments that have no history of fire.

FS06.P.16

Effects of parasitism *Struthanthus flexicaulis* (Mart.) Mart. (Loranthaceae) on the germination of *Mimosa calodendron* Mart. (Fabaceae)

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Mimosa calodendron Mart. (Fabaceae) is an endemic species to the rocky fields on ironstone outcrops of the Iron Quadrangle and host of the mistletoe *Struthanthus flexicaulis* (Mart.) Mart. (Loranthaceae). Parasites may reduce the adaptive value of their host. Thus, factors affecting the production of fruits, viability and germination of the seeds are among the most important to be evaluated. The objective of this study was to investigate the effect of parasitism by *S. flexicaulis* on seed germination of *M. calodendron*. Seeds were collected from 40 individuals (20 infected and 20 not infected). In germination tests, 100 seeds were randomly selected for each treatment (control, mechanical scarification, chemical scarification and mechanical-chemical scarification), monitored at 20 °C in both groups (parasitized and not parasitized) for the experiments, making a total of 800 seeds. Parasitism significantly affected the proportion of germinated seeds (GLM: fator = parasitismo x tratamento: GL = 3; SQ = 29,094; F = 4,726; p = 0,009). The germination speed was not influenced by the presence of the parasite (GLM: fator = parasitism x tratament: GL = 3; SQ = 8,187; F = 1,978; p = 0,144). The seeds resulting from parasitized hosts were equally viable as those from those parasite-free by tetrazolium test. Scarification treatments influenced the percentage and germination rate of seeds in both groups. It is concluded that the species has dormancy through the seed coat and that the effect of parasitism on germination is significant in view of the values of germination percentage. In addition, the effects of parasitism may influence other aspects of seed growth, for example, the size and weight of seeds.

FS06.P.17

Effect of pre-germination treatments and size on the germination of Cobretum mellifluum Eichler var. mellifluum

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Studies concerning germination are important for the understanding of the reproductive strategies of the species, besides subsidizing studies for regeneration and conservation of forest resources. The aim of this study was to verify the germination of seeds of *Combretum mellifluum* Eichler var. *mellifluum* under different pre-germination treatments and sizes. The seeds collection was carried out in September/2010, in the Environmental Protection Area (EPA) of the Pandeiros River, north of Minas Gerais State. We selected 180 seeds of 10 different mother trees, totaling 1800 seeds. The seeds were separated into different size classes (small, medium and large seeds) and then subjected to two scarification treatments: thermal (hot water from 70 to 50 ° C) and mechanical (sandpaper n° 80), besides control (intact seeds). The experiment was conducted in two environments: germination chamber (GERBOX® boxes with 10 seeds in each and filter paper as substrate) and greenhouse (planting at a depth of 1.5 cm in plastic bags of 35 cm x 20 cm containing topsoil and sand). To detect differences in germination among size classes and pre-germination treatments, the Analysis of Variance was carried out and Tukey post-test at 5% of probability. The germination varied among treatments ($gl = 2$; $F = 9.92$; $p < 0.001$; $n = 30$; and $gl = 2$; $F = 7.03$; $p < 0.001$; $n = 30$; greenhouse and germination chamber respectively). It was observed low germination percentage (less than 20%), and both thermal and mechanical scarification influenced negatively the germination of the seeds in both environments. The germination of *C. mellifluum* was not influenced by the size of the seeds, neither by the tested environments. The control seeds (not scarified) presented higher germination rates compared to the scarified ones, suggesting therefore the absence of physical dormancy for *C. mellifluum* seeds.

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FS06.P.18

Germination of two Amazonian tree legumes (*Parkia multijuga* Benth. and *Parkia nitida* Miq.) based on a thermal time model

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Parkia is a pantropical genus of tree legumes with its highest diversity at Amazon region. We aimed to evaluate germination of *Parkia nitida* and *Parkia multijuga* based on a thermal time model in order to investigate some ecological aspects of the species. Seeds were collected at "Flona do Jamari", RO, Brazil. Germination tests were performed over filter paper in germination chambers at constant temperatures from 10-40°C. Weibull distribution was used to estimate rate of germination for different percentage fractions of the sample and Probit analysis to estimate base temperature (Tb, °C) and thermal-time (°C-day). Optimum germination temperature lies between 27.5-32.5°C for *P. nitida* and 17.5-35°C for *P. multijuga*. Germination rate of *P. nitida* increases linearly with temperature below the optimum and decreases above it. *P. multijuga* exhibits similar relation at infra-optimum temperatures but a different response at the supra-optimal interval, in which the rate increases as germinability decreases with temperature. Tb is similar (9°C) for different percentage fractions in *P. nitida*, whereas thermal-time distributes normally from 17.5 to 81°C-day. For *P. multijuga*, unlike model prediction, we found different Tb values (5.1 to 12.3°C) and similar thermal-time (52°C-day) for percentage fractions of germination. Curves of cumulative germination against thermal-time describe well *P. nitida* infra-optimal response (R^2 = 0.88). Tests below 10°C would be necessary to explain with a greater accuracy the infra-optimal interval in *P. multijuga* (R^2 = 0.75). Ceiling temperatures (Tc) could not be estimated for the species since both exhibited significant germination even at 40°C (*P. nitida* 81%, *P. multijuga* 36%). We conclude that Tc is above 40°C in both species and it is higher in *P. nitida. P. multijuga* exhibits a thermal germination range displaced toward lower temperatures as compared to *P. nitida*, which was more resistant to higher temperatures concerning germination behavior.

FS06.P.19

Germination of *Theobroma cacao* L. as described by a thermal time model

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Germination process is strongly influenced by environmental temperature. *Theobroma cacao* (cocoa) is a tree species originated from North America tropical rain forest that shows socioeconomical and ecological importance as forestry resource at the Amazon region. We aimed to describe seed germination of cocoa based on a thermal time model. Seeds were obtained in partnership with CEPLAC/RO, Brazil. After seed processing, germination tests were performed over moistened filter paper from 10 to 40°C in germination chambers. We used Weibull distribution to estimate the germination rate for different percentage fractions of the sample and Probit analysis to estimate base temperature (Tb, °C), thermal time (°C-day) and ceiling temperature (Tc). Germinability is higher than 80% from 12.5 to 37°C, reaching from 95 to 100% at most temperatures at this range. The rate of germination increases with temperature along the whole thermal range even when percentage of germination is reduced at higher temperatures. Optimal germination temperature lies between 30 and 37°C. Tb is similar (8°C) for different percentage fractions of the sample whereas thermal time was assumed to be normally distributed (median = 55.47 and standard deviation = 22.13°C-day). The model describes well the isothermal germination at the infra-optimal temperature interval (R^2 = 0.90). At the supra-optimal range Tc was assumed to follow a normal distribution (median = 40.55 and standard deviation = 1.89°C) while the thermal-time values were nearly constant (6°C-day) among the fractions. The model fitted well the germination data at the supra-optimal thermal range (R^2 = 0.91). We conclude that a thermal time model can be used to describe the isothermal germination of cocoa seeds both at the infra and supra-optimal temperature range.

FS06.P.20

The role of granivorous birds and rodents in post-dispersal seed removal in six Atlantic forest fragments

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Granivorous birds (tinamous, pigeons and doves) seem to benefit from habitat disturbance in the Brazilian Atlantic forest, but how these changes may affect seed predation and plant recruitment is unclear. We investigated if post-dispersal seed predation changes in forest fragments following an increase in the abundance of granivorous birds. We evaluated the abundance of granivorous birds by point count sampling in six fragments ranging in size from 40 ha to 500 ha in Alfenas, MG, Southeast Brazil. We also compared the role of birds and small rodents as seed predators of *Croton floribundus* (Euphorbiaceae) using selective exclosure treatments in the same forest fragments. Seed predation increased in small forest fragments. Despite an increase in the abundance of granivorous birds in smaller fragments, most seed removal was done by rodents rather than by birds in the experiments. There was no relationship between bird abundance and seed removal levels both at local (within fragments) or regional (among fragments) scales. Increases in the abundance of granivorous birds were not followed by an increase in seed predation of *C. floribundus* in the fragments studied. Several pigeon and dove species seem to use the forest fragments just for shelter and resting, feeding on the surrounding matrix. Explanations for the the increased seed removal in small fragments include possible changes in the diversity of the rodent community or a scarcity of alternative food sources, but these remain to be confirmed for the Alfenas region.
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FS06.P.21

Stand Structure and Light, but not Soil Resources, Drive the Assembly of Seedling Communities in Tropical Secondary Forests through Multivariate Causal Relationships

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Background/Hypotheses – The classic deterministic models of tropical forest succession predicts segregation of species with different life history strategies along the principal successional axis of environmental variation, while unrelated variation in local soil resources can cause divergent successional pathways. In the present study, we used structural equation modeling (SEM) to evaluate the multivariate relationships that underlie these succession models: (a) stand structure changes predictably with age; (b) resource availability changes predictably with stand structure; (c) variation in resource availability drives the assembly of seedling community through the selection of specific life history strategies.

Data – This study is conducted as part of a large secondary forest dynamics study in central Panama and includes 94 0.1-ha permanent sample plots in 1-32 year old secondary forests across a 15 km^2 rural landscape. In each plot we collected data on understory light, soil nutrients, and dry season soil water content (SWC), censused all trees, shrubs, lianas and palms with a diameter ≥ 1 cm and (iii) performed a seedling census in 20 1-m^2 subplots. Lastly, we collected plant functional trait data for a large proportion of the species (> 75% of individuals in all plots).

Results –The data supported a path model in which the composition of the seedling communities is strongly driven by successional changes in stand structure and related changes in light availability through direct and indirect causal paths (Squared Multiple Correlations = 0.72). The observed variation in soil resources, with significant increases in SWC and phosphorus during succession, did not influence seedling composition. Our results provide strong evidence for deterministic succession mediated partially by light. However, a strong direct causal path from basal area to species composition indicates the existence of other unmeasured variables that covary with stand structure and light but independently influence seedling community assembly during succession.

FS07.P.01

Floral convergence and divergence of Caribbean Heliconia across a geographic mosaic of pollinators

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Geographic variation in interspecific interactions potentially drives processes of local adaptation and phenotypic divergence. This study examined geographic variation in floral traits and plant-pollinator interactions in two species of the genus *Heliconia* across three Caribbean islands: Puerto Rico, Hispaniola and Dominica. We hypothesized that floral characters would reflect selection by the major pollinators of each *Heliconia* species on each island. We measured floral traits, recorded pollinator visits to flowers, and conducted a multivariate analysis of floral phenotypes to assess patterns of phenotypic similarity/ dissimilarity among species and among populations of each species. We found that the two sympatric *Heliconia* species had similar floral phenotypes on the island of Hispaniola, where they are pollinated by the Antillean Mango hummingbird. In contrast, the flowers of *H. caribaea* and *H. bihai* differed drastically on the island of Dominica, where they are preferentially pollinated by either males or females of the purple-throat carib, a sexually dimorphic hummingbird species. Among-population patterns of floral variation showed that *H. caribaea* flowers from all islands had long nectar chambers and short corolla tubes. In contrast, *H. bihai* populations were strongly divergent: on Dominica *H. bihai* flowers had short nectar chambers and long corolla tubes, on Hispaniola, *H. bihai* flowers resembled those of *H. caribaea*. Floral variation of heliconias across islands corresponded with variation in bill traits of their principal pollinators, suggesting parallel selective regimes on different islands. In contrast among-population variation of *H. bihai* flowers reflect selection by different pollinator species on different islands. The study suggests pollinator-mediated selection is driving floral convergence and divergence through the evolution of locally-adapted plant variants across a mosaic of pollinator species.

FS07.P.03

Energy of nectar for hummingbirds in an area of Cerrado in central Brazil

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Among the floral resources, nectar is the most important, providing nutrition to several animals. Few studies refer to the amount of energy of floral nectar for hummingbirds or inform about the carrying capacity for them in a given area. This study aimed to identify and assess the availability of flower nectar for hummingbirds in terms of energy in a Cerrado biome area in Uberlândia, Minas Gerais, Brazil. Forty five plant species that can be used by hummingbirds were recorded, of which only 20 were ornithophilous. The recordings were made over 22 months at different physiognomies of the Cerrado vegetation including seasonal semideciduous forest, gallery forests, edge of gallery forest, cerrado *sensu stricto* savanna and open grasslands such as campo sujo, and palm swamp. The average volume and concentration of nectar for each plant species were used to estimate the amount of resources in calories per flower. The nectar available in different physiognomies varied widely, showing pulses of energy that could keep about 70 hummingbirds per hectare depending on the season. Moreover, there were periods in which no physiognomies alone would have sufficient energy to maintain not even a hummingbird per hectare. The low supply and the variation in availability of nectar of ornithophilous species for hummingbirds in the Cerrado were compensated by the use of non-ornithophilous species. Moreover, according to the availability of nectar, hummingbirds possibly migrate between different physiognomies to fulfill their energy requirements.

FS07.P.04

Breeding systems in Bromeliaceae: Is selfing more common than we know?

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Bromeliaceae, is one of the most conspicuous and well-defined monocot families, is widely known for its potential for adaptive radiation and for the ecological contribution to structural complexity of the environment.Consistent information on the breeding systems (BS) in Bromeliaceae is scatter, and their species were traditionally considered as predominant outcrossers. We assess the BS (self-compatibility and self-incompatibility) of 40 sympatric bromeliad species at an Atlantic rainforest reminiscent in southeastern Brazil using controlled pollination experiments (autonomous selfing, self- and cross-pollination). We also conducted a literature survey to confront our experiments with available information and determined the state of knowledge of the reproductive biology (RB) on the family.We found comparable information for 44 bromeliad species distributed in Brazil, Mexico, Costa Rica and Puerto Rico. Similar patterns were found between the literature and our study: (1) most species from both manipulated experiments (75%) and literature survey (72%) were self-compatible (SC); (2) species from the subfamilies Tillandsioideae and Pitcairnioideae were predominantly SC; and (3) Bromelioideae showed greater variation in BS. Most studies are hold in the Atlantic Rainforest domain in Brazil, a recognize area of high bromeliad richness and diversity. Surprisingly information is lacking for the RB of species from other recognized areas of bromeliad endemism. There is just one comparable data for the Amazonian basin and a few more for the Caribbean area, but there is no record for species from the Guayana Shield or Andean slope. Our study is the first one to consider a great number of sympatric species and almost equal the number of literature surveyed species for the family. Both data suggested that selfing in Bromeliaceae is more frequent and involve more species than reports of self-incompatibility system. Thus, we defend the hypothesis of self-compatibility as a reproductive isolating mechanism in the presence of pollen flow among sympatric species.

FS07.P.05

Changes in the structure of the bee community (Hymenoptera: Apoidea) along a successional chronosequence in a Mexican tropical dry forest

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The effects of human disturbances in tropical forest are well documented but the response of the bee community is still unclear. This is particularly true for tropical dry forests, where ca. 80% of plants depend upon bees as principal pollinators. Although secondary vegetation provides important resources for bee species, these may change in quantity and quality along the regeneration process. We studied bee communities at nine sites representing a successional chronosequence (2-65 yr in age) in a Mexican tropical dry forest. Bees were sampled at 2-mointervals for one year, identified to morpho-species and classified by guilds based on social habit, nesting attributes, and size. Plants where bees were collected were classified by growth form and stratum (canopy vs. understory). We used an RLQ analysis to correlate bee species traits and their abundance with structural attributes of the fallows. A total of 69 species and 483 individuals from five bee families were collected. Shannon diversity index for the bee community decreased with fallow age ($P = 0.034$). Similar trends, albeit non-significant, were observed for species richness and abundance. The first RQL axis explained 79.9% of the variance and was positively related to fallow age, vegetation complexity, and the eusocial habit. Conversely, this axis was negatively related to solitary and parasocial habits, and resource abundance. The second RQL axis (14.8% of variance) was negatively related to the soil-nesting habit and frequency of shrub use, and positively related to the aerial-nesting habit, bee size and the frequency of tree use. The youngest fallows hosted the largest diversity and richness, overall and of solitary and parasocial bees. Conversely, eusocial and/or larger bees preferred older fallows, suggesting a stronger dependency on mature forest trees. Our results suggest that niche diversification plays a key role in the coexistence of bee species in these systems.

FS07.P.06

DOES THE DISTANCE FROM NATURAL HABITAT AFFECT THE RE-ESTABLISHMENT OF PLANT-POLLINATOR INTERACTIONS IN RESTORED FORESTS? PRELIMINARY FINDINGS

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Ecological restoration is a rapidly evolving practice whose goal is to assist the recovery of degraded ecosystems; it focus normally on some target plant species in the hope that natural processes will subsequently lead to the reestablishment of the whole community. In tropical ecosystems, the high diversity and complexity of interactions among organisms make the restoration a challenge. Despite the increasing number of restoration initiatives in São Paulo State on the last decade, whether the programs successfully reinstate ecological interactions remains to be studied. Pollination is an ubiquitous interaction between plant and animals that may not reestablish properly in communities undergoing restoration, because some pollinators may have very specific habitat requirements not promptly reached in restored ecosystems. Our study focused on plant-pollinator interactions in six restored areas of Atlantic Semi-deciduous Forest located in a highly fragmented landscape with intensively managed agricultural fields of sugar cane. We tested the hypothesis that the richness and abundance of pollinator insects, as well as the complexity of mutualistic networks, are higher in the three restored areas implemented alongside natural habitats than in the three restored areas located at least 1000 meters from forest patches. Although preliminary, our results suggest that plant-pollinator communities were established equally on all the restored sites. Besides the slightly lower number of flowering plant species in the areas restored far from natural habitats, no other differences were found between areas. Richness and abundance of insect as well as the network properties connectance and linkage density were similar among all six areas. Sampling is still in course and the additional data will allow a more detailed analysis of network properties. The investigation of functional aspects of communities undergoing restoration is crucial to improve our current understanding of the processes underlying successful ecological restoration. (Grants from CNPq)

FS07.P.07

Effect of disturbance on the community of floral visitors of *Allionia incarnata* (Nyctaginaceae)

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Plant-pollinator interactions favor the maintenance of ecosystems and assure the availability of resources for other organisms within the ecosystem. Anthropogenic activities such as fragmentation, change of land use, and deforestation may affect plant-pollinator interactions. We determined the effect of disturbance on the community of floral visitors of *Allionia incarnata* (Nyctaginaceae) in Puebla State, México. We conducted observations and collections of floral visitors in two sites with contrasting disturbance (conserved and disturbed) simultaneously during three consecutive days on September, 2011 from 0800 to 1500 h, which corresponds to the period of time in which flowers are in anthesis. We determined species richness, species abundance and the Shannon diversity index for each site and variation in the abundance of floral visitors every hour throughout floral anthesis. A total of 172 individuals of floral visitors were collected in each site. Coleoptera, Diptera, Hemiptera, Hymenoptera and Lepidoptera were the floral visitors. Coleoptera followed by Hemiptera (86 and 116 individuals, and 83 and 20 individuals in the conserved and disturbed site, respectively) were the most abundant groups of floral visitors in both sites. Eight species of floral visitors were collected in each site; however, only three species were common to both sites. Total and by insect group species richness, total abundance of floral visitors, and abundance of Coleoptera, Diptera, Hymenoptera and Lepidoptera were not significantly different between sites. Hemiptera abundance was significantly higher in the conserved site. The every-hour abundance of Diptera, Hemiptera, Hymenoptera, Lepidoptera and Formicidae did not differ significantly between sites. The every-hour abundance of Coleoptera and of all floral visitors, were significantly different between sites. Our results suggest that disturbance has an effect on the composition of the community of floral visitors, particularly in the abundance of Hemiptera and Coleoptera abundance. These groups of insects can be indicators of disturbance.

FS07.P.08

Influence of different matrix types surrounding forest fragments on floral visitors of *Psychotria vellosiana* (Rubiaceae)

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Human-fragmented forests are generally surrounded by a matrix of structurally complexity and low biomass, such as pastures and croplands. Differences in structural complexity and biomass in varied types of matrices can result in differences in microclimate that could influence pollinators, especially insects, and consequently plant reproduction. The aim of this study was to determine whether there are differences in the frequency of floral visits and the richness of visitors of *Psychotria vellosiana* (Rubiaceae) among forest fragments of Atlantic forest bordered by three different matrix types (coffee, sugar cane and pasture). Our study was carried out in nine forest fragments (ranging from 15 to 100 ha), with three forest fragments surrounded by each type of matrix, near Alfenas, Minas Gerais, Brazil. The observations of flower visitors were made along a 40 m transect in the interior of the fragments in 36 shrubs (12 in each matrix type). The observations were made between 0700-1700 h during flowering (15 days). Each shrub was observed for 10 min period (total 108 periods) and the number of insect visitors and the frequency of visits were recorded. The abundance and richness of floral visitors of *P. vellosiana* were not different among matrices (F=2.03, P=0.14; F= 1.13, P=0.32, respectively) nor among fragments (F=1.74, P=0.12; F=1.13, P=0.35, respectively). The diversity of the community (Shannon Diversity Test-t) and the similarity (Anosim) of floral visitors also were not different between matrices, but the diversity of the community was different among some fragments (Shannon Diversity Test-t). The type of matrix did not influence the floral visits, probably because the fragments are very small and the fragmentation process was ancient (at least 37 years). These factors may have more influence than the surrounding matrix.
We would like to thanks the FAPEMIG for the financial support.

FS07.P.09

Resin-producing floral structures of two *Clusia* species in a restinga habitat.

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Knowledge of the dynamics of floral secretions and their role in maintaining the interactions with pollinators is of great importance. Nurse plants shelter other species, often forming vegetation islands, particularly in arid zones such as restingas, which have sandy soil with a low capacity to retain water and nutrients, high salt concentration, and high exposure to sunlight and ocean winds. Species of *Clusia* (Clusiaceae) serve as nurse plants, positively contributing to the local biodiversity and biomass. Production of resin as a floral reward is unusual, and is known only in six genera of angiosperms, including *Clusia*. This resin has components with wide ecological importance and features such as slow decomposition, important in tropical environments. Bees of superfamily Apoidea collect floral resins and use them as a sticky nest-building material with antimicrobial properties. Resin is the main floral resource for *Trigona spinipes* and *Euglossa cordata*, effective pollinators of the dioecious species *Clusia fluminensis* and *C. lanceolata*, both of which occur in restingas. We analyzed the resin-producing floral structures associated with the pollination of these species. Samples of flowers in different stages of development, collected in the restinga of Maricá, Rio de Janeiro, were fixed and processed for light and scanning electron microscopy studies, according to the usual techniques. Resin secretory spaces (cavities and canals), present in all flower organs, are especially abundant in the androecium. Located on the filament periphery, they run throughout its length, reaching the distal portion. At anthesis, the resin is released through rupture points in the one-layered epidermis. The anther wall is composed by epidermis and endothecium layers, and drusiferous idioblasts are present over the entire stamen. The staminodes do not produce pollen grains but retain the function of resin production. Despite their morphological differences, the stamens are structurally similar.
Support: FAPESP

FS07.P.10

BROAD-DOMAIN PREDATORS DECREASE POLLINATOR VISITATION ACROSS ECOSYSTEM BOUNDARIES

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The indirect effects of predators on trophic cascades have been demonstrated with greater magnitude in aquatic ecosystems compared to terrestrial ecosystems, bringing both positive and negative effects to plants. However, these top-down forces can cross ecosystem boundaries. Dragonflies have complex life cycle (i.e., life stages in water and land), and are broad-domain predators because they have a large foraging area and high ability to pursue prey. As they frequently include floral visitors in their diet, we expect that flowers from patches close to water sources, where dragonflies are abundant, can represent “landscapes of fear”. So in these patches less pollinators are expected to be found due to predation risk. In this study we tested predation risk effects of broad-domain predators (i.e., dragonflies) on the visitation rate of pollinators to flowers of plants (*Ludwigia* sp., Onagraceae) that occur naturally near the margins of lakes in the Biological Reserve of Serra do Japi, southeastern Brazil. Each experimental block consisted of flowers set up near the lake margins, and 35 m apart; we run seven experimental blocks in seven different lakes. These flowers were simultaneously observed for 60 min. The rate of pollinator visit to flowers of *Ludwigia* sp. is about 2 times lower near the lakes than far from these water sources ($F = 8.95$, $P = 0.024$, $N = 7$). The floral visitors were Apoidea (89.5%), Syrphidae (8%), Lepidoptera (1.25%) and Vespidae (1.25%). The most common bees were *Trigona spinipes*, *Plebeia* sp., *Apis mellifera*, *Tetragonisca angustula*, *Xylocopa* sp., and *Bombus brasiliensis*, and were affected by predation risk ($F = 6.83$, $P = 0.039$, $N = 7$); abundance of Diptera and Lepidoptera did not differ between treatments. Our results suggest that patches near water sources can represent landscapes of fear for pollinators. It still remains to be investigated if the predation risk reported here can cascade down to plant fitness.

FS07.P.11

Floral biology of the Neotropical Galipeinae (Rutaceae): morphology, pollination and flower specialization

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The convergent evolution of floral traits and its predictive association to specific pollinators ("pollination syndromes" concept) have been reported in several floral biology studies. However, more recently it has been demonstrated that there is not always a link between floral traits and specific pollinator types, suggesting that generalization in pollination systems may be inaccurate. In particular, it has been advocated that grouping pollinators in functional groups is a very useful methodology to access whether flowers are specialized or not, since these groups would be based in similarities regarding their behavior on flower and selective pressure exerted. In this way, the effectiveness of pollination of each functional group could vary according to the different floral types. The subtribe Galipeinae (Rutaceae) is an interesting group of plants to study the relation of floral traits to pollination systems since its members present different types of tubular flowers with traits varying both qualitatively and quantitatively. Also its flowers present features that are expected to be associated to specialization toward specific functional groups of pollinators. Here, we present a comparative study of floral biology, and pollination of Galipeinae, to access whether they present specialized flower morphologies to certain functional group of pollinators, or alternatively if they present a generalized pollination system. First, we find three general flower morphologies: (1) long white tubular flower, strong sweet scented; (2) short bright pink tubular flower, with weak odour; and (3) short light pink tubular flower, with no odour. Our results indicate that both specialized and generalized pollination systems occur in Galipeinae. More specifically, specialized pollination system to Lepidoptera and to hummingbird is reported. In this study the floral traits that contributed to ecological specialization were tube length and width, and floral odour, being white long tubular flowers with sweet scent the most common ecological condition associated to nocturnal lepidopteran pollination.

FS07.P.12

Resource Availability and Flower Visitation Rate in Hummingbirds of the Seasonal Semi-Deciduous Forest of Paraná, Brazil.

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The dynamics of concentration and volume of flower nectar production influence floral visitation rate. Moreover, larger and more flowers may attract more pollinators. This work aimed to verify how the variation in the nectar production in ornithophilous flowers throughout anthesis occurs and if the availability of resources affects the hummingbird visitation rate. Among the eight ornithophilous species found in the Parque Estadual Lago Azul (PELA), most of which were trees, five were used to evaluate nectar production. Extractions were made of nectar in flowers every two hours and volume and concentration were measured. Flowers were measured and weighed and the influence of flower size on the nectar production was verified. Nectar volume varied but the concentration remained relatively constant throughout the morning. Flowers with larger calyx diameters and/or greater biomass produced more nectar in four of the five species. Nine species of hummingbirds visited these ornithophilous flowers, only one of which was a hummingbird of the subfamily Phaethornithinae. The species of Trochilinae had the highest visitation rates. The hummingbird visitation rates varied, but this was not related to the dynamics of nectar production. The relationship between hummingbird activity in plants and the quantity and quality of nectar produced over the period was weak, but the number of flowers available in the community may affect hummingbird activity instead. The foraging behavior of these birds or the use of their environment may help explain the different flower visitation rates.
***Keywords*:** nectar production, hummingbirds, Atlantic Forest, visitation rate, resource availability, flower size.

FS07.P.13

Drymonia strigosa: transition from melitophily to ornitophily?

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The transition from melitophily to ornitophily is one of the most frequent changes reported in studies of pollination system evolution; however, the ecological drivers of these transitions are little known, particularly for tropical plant species. We documented the floral biology of the epiphytic shrub *Drymonia strigosa* (Gesneriaceae) to evaluate the importance of hummingbirds and bees as potential selective agents of floral traits. We documented floral phenology, frequency and behavior of floral visitors, nectar production, and breeding system of *D. strigosa* in the region of Los Tuxtlas, Veracruz, Mexico. *Drymonia strigosa* is protandrous and promotes outcrossing through synchrony of sexual phases within individuals; however autonomous self-pollination is possible in some flowers. Floral traits in *D. strigosa* are associated with ornitophily except for the anthers, which have poricidal dehiscence. Poricidal anthers characterize the genus *Drymonia* and have been regarded as an adaptation for more effective pollen transfer by bees. We found that *D. strigosa* provides an important food source for the endemic hummingbird species *Campylopterus curvipennis* subsp. *excellens*, and is also visited infrequently by two other hummingbird species. The bee *Trigona fulviventris* is also common floral visitor that takes nectar through a hole at the base of the corolla tube, and only occasionally contacts stigmas. The results suggest that *D. strigosa* has a highly specialized pollination system involving few species of hummingbirds with bees acting as nectar robbers rather than pollinators. Since natural fruit production is high, poricidal anther dehiscence associated with narrow tubular corollas appear to function effectively in pollen transfer by hummingbirds while deterring pollen robbing by bees. Our results suggest that floral adaptations are context dependent and future studies will address the role of bees and hummingbirds in the evolution of floral traits in the species.

FS07.P.14

Mating system and conservation strategies for *Butia eriospatha*: a vulnerable palm species from the Brazilian Atlantic Forest

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Important advances have been made in palm evolutionary biology concerning life history, molecular evolution, and population genetics. However, our knowledge is still somewhat limited with respect to reproductive biology, specifically relating to the mating system of the threatened palm species. In the Atlantic Forest, natural populations of the vulnerable palm species *Butia eriospatha* (Martius ex Drude) Beccari are suffering the consequences of human intervention especially through loss of habitat, illegal sale of specimens, and cattle farming. As reductions in population sizes is becoming more common due to anthropogenic disturbances, understanding the reproductive biology of a plant species is a key element in conservation programs. In order to determine how *B. erisopatha* reproduces, mating system estimates were obtained by conducting progeny array analyses (from one population in the Southern Brazil) using microsatellite loci. Mating system analyses indicate that *B. eriospatha* is a predominantly outcrossing species (t_m=0.96), although a certain degree of biparental inbreeding does occur. The species is self-compatible and reproduction may also occur by geitonogamy, indicating the ability of isolated populations to survive and persist. The effective size of variance of open-pollinated seeds was estimated at 2.67, indicating that seeds for conservation programs must be collected from a large number of seed-trees. Hence, ex situ conservation based on estimates of effective size of variance for *B. eriospatha* is a high priority strategy that will help ensure the conservation of the genetic variability that remains. Further, while ex situ conservation programs are essential strategies in protecting *B. eriospatha*, combating illegal trade is necessary to improve the current state of this species. Another possible step in preserving the species is related to cattle herding. Placing enclosures around some reproductive plants could encourage seedling survival. However, such a strategy requires effective management as restricting the area can lead to genetic structuring within populations.

FS07.P.15

IDENTIFICATION OF THE MAJOR POLLEN RESOURCES USED BY THE STINGLESS BEE Melipona quadrifasciata (APIDAE)

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Melipona quadrifasciata (mandaçaia), a social stingless bee native to Brazil, plays a valuable role in the pollination of the native flora and is responsible for 40-90% of the pollination of native tree species, depending on the ecosystem. *Melipona quadrifasciata* colonies are very difficult to locate in the wild, which makes identification of the main pollen resources used by this species a fundamental factor in the conservation and maintenance of these bees. The aim of this work was to identify the main floral resources used by *M quadrifasciata* during the autumn and winter when there are fewer flowering plants and consequently less food resources available for these bees. A preliminary study analyzed pollen samples collected on the USP-Ribeirão Preto campus over six months, from May to October, 2010. The pollen was removed from the pollen pots, homogenized and prepared for analysis using the standard technique of acetolysis. The pollen types were identified based on published keys or reports and were assessed qualitatively. Thirty pollen types were identified on *M. quadrifasciata*, with most of the pollen belonging to the families Solanaceae and Myrtaceae. The most important pollen grains found in May were from *Solanum* spp. (90%). This pattern was also observed in other species of *Melipona* that collect pollen grains through vibration. Pollen grains belonging to the Myrtaceae were encountered in all of the months studied. These findings agree with other studies of *Melipona* in Brazil and show that Myrtaceae pollen is a major food resource for these bees.

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FS07.P.16

Floral anatomy in *Bulbophyllum* sect. *Didactyle* Cogn. (Orchidaceae, Asparagales)

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Bulbophyllum sect. *Didactyle*, with seven neotropical species, was proposed by molecular phylogenetic analyses as a monophyletic group. The species bear flowers with patent sepals and petals, a three-lobed fleshy lip with orbicular side lobes, and a column foot with two-lobed end. The aim of this study was to characterize anatomically the flower of *B. exaltatum*, *B. involutum*, *B. peri*, *B. tripetalum* and *B. weddellii*, indicating possible synapomorphies. Usual techniques of light microscopy were employed. All organs showed two types of idioblasts in the mesophyll, one with a raphide and the other aquiferous with wall thickenings. Sepals were glabrous and possess uniseriate epidermis, homogenous mesophyll, and three collateral vascular bundles. Petals showed unicellular tricomes on the margin, uniseriate epidermis, homogenous mesophyll and a single vascular bundle (except for *B. involutum* which presented two). Lip epidermis is uniseriate with long trichomes in both epichile and hypochile regions (except for *B. peri* in which they are short); the mesophyll was homogenous (but loose in the petaloid hypochile of *B. weddellii*), with lipids and starch grains at the callus; the callus bear a secretory cavity that varied in shape and size between species; the number of vascular bundles in the callus varied between species. The anther showed a papillose epidermis, two to three endothecial layers and four pollinia; an enlarged connective tissue was observed (more conspicuously in *B. weddellii* and *B. peri*). In cross section, the ovary is mostly triangular, six-lobed, each lobe with a pole of aquiferous cells, 6 collateral vascular bundles surrounded by a starchy sheath. The species studied here share some anatomic characters, such as raphide and aquiferous idioblasts, secretory cavity of the lip, which may constitute synapomorphies, corroborating their grouping in section *Didactyle*. As an autapomorphy of *B. weddellii* , the petaloid hypochile with loose parenchyma was identified.

FS07.P.17

Image is nothing: pollinators' frequency is not related with floral display on five *Tibouchina* species (Melastomataceae)

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Studies on pollination biology often relate pollinators' frequency with floral display. Five synchronopatric species of *Tibouchina* with similar pollinators and flower traits were compared to test this relationship. Floral display per species was measured as the average number of flowers per individual and as flower diameter. Pollinators' frequency was observed during 105 hours (21 h/sp). The difference between flower and fruit production during the peak per individual (calculated from a qualitative phenology index), and the fruit set in bagged and exposed flowers were used to access pollinators' frequency indirectly. The species had different average number of flowers ($F_{(4,60)}$=14.486, $p<0.001$). *Tibouchina granulosa* had the largest number of flowers/individual (776.93±126.13 SE). Flower diameter also differed among the species ($F_{(4,62)}$=30.635, $p<0.001$). *Tibouchina fothergillae* together with *T. granulosa* had the largest flowers (6.17±0.12cm; 5.61±0.26cm respectively). *Tibouchina langsdorffiana* had smaller flowers (4.37±0.20cm) than the last two and showed less flowers than *T. granulosa* (420.07±133.12 flowers), but had the largest pollinators' frequency (15.61 visits/flower/day) followed by *T. granulosa* (6.35), *T. clavata* (5.31), *T. heteromalla* (0.21), and *T. fothergillae* (0.03). The difference between fruiting and flowering peaks was distinct among all the species ($F_{(4,62)}$=35.956, $p<0.001$), being the difference between the group of *Tibouchina langsdorffiana*, *T. clavata* and *T. granulosa* higher than that of *T. heteromalla* and *T. fothergillae*. Pollination experiments indicated that *T. langsdorffiana* and *T. granulosa* are 100% dependent on pollinators, *T. clavata* is partially dependent on them, while *T. heteromalla* and *T. fothergillae* did not produce fruits under natural conditions. Concluding, species with low floral display (*e.g. T. langsdorffiana*) may have larger pollinators' frequency than species with large floral displays (*e.g. T. granulosa* and *T. fothergillae*). Thus, floral display in these species may not be the only trait influencing pollinators' frequency; the quantity and quality of the rewards might also play a decisive role.

FS07.P.18

Effects of florivory on floral visitors and reproductive success in Sagittaria lancifolia (Alismataceae) in a Mexican wetland, Veracruz, Mexico

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Florivory is a plant-animal interaction where herbivores consume reproductive structures. It has been documented that this type of herbivory could negatively affect plant fitness. *Sagittaria lancifolia* is a perennial herb. It's inflorescences of female and male flowers (monoecious) live only a few hours. Flowering occurs year round. The study was conducted at a Mexican wetland (La Mancha) site in Veracruz, Mexico. *S. lancifolia* naturally exhibits different levels of florivory mainly caused by *Tanysphyrus lemnae* (Curculionidae). We evaluated if florivory negatively affects the frequency of floral visitors and its consequences on reproductive success using six categories of petal damage (0, 1-5, <25, 26-50, 51-75 and 76-100%) in female and male flowers. Reproductive success was evaluated by fruit set in each damage category. Results show that florivory is greater in female than male flowers (IH= 2.0 and 1.5 respectively, n_{total}=1138 flowers). Considering both types of flowers, more than 80% of floral visitors correspond to Hymenoptera and remnant visitors correspond to four orders. Flowers with high damage exhibited less frequency of floral visitors. Reproductive success is higher in flowers with less than high florivory (fruit set: 89% and 61%, respectively). We performed hand pollination to evaluate pollen limitation using flowers in three categories 0%, 76-100% and control. We found no differences in these manipulations (fruit set: 86%, 94% and 86%, respectively). We concluded that florivory negatively affects the frequency of floral visitors in flowers with > 25% of consumed area and it has negative consequences on fitness. *Apis mellifera* is one of the main pollinators determined by frequency and behavior in flowers. Probably, differences in fitness occur because of pollen limitation in flowers due to failure of pollination services. The latter suggests less genetic input from plants with high florivory. We are currently examining seed and seedling performance as result of intensity of florivory.

FS07.P.19

The dark side of female flowers: sexual mimicry and pollination by deceit in a monoecious species

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Pollination by deceit through flower mimicry is a common strategy in many monoecious species in which rewardless female flowers visually resemble the rewarding male flowers. Despite the wide occurrence of sexual mimicry in many taxa of monoecious species, colour and spectral reflectance patterns between male and female flowers have been seldom analysed from pollinator's perspective. *Momordica charantia* (Cucurbitaceae) is a ruderal monoecious vine native from Africa introduced in South America. In order to investigate how mimicry operates and if pollinators can distinguish between nectar-rewarding male flowers from rewardless females, we analysed morphology, colour and spectral reflectance patterns of the flowers in *M. charantia*. We quantified the sexual ratio, determined the main pollinators and conducted a flower choice experiment to evaluate pollinator's preferences and quantify the handling time in each morph. *Momordica charantia* is pollinated mainly by Halictidae and Meliponinae bees and sexual ratio was 2.66 biased towards male flowers. PCA analysis did not show differences in the overall morphology between both sexual morphs. The mean reflectance spectra of petals were very similar in both morphs, but anthers and stigmas exhibited a different UV reflection pattern. Anthers reflected UV light, but stigmas absorbed it creating a dark spot in the middle of the flower. UV absorption was also observed under the anthers in the region where nectar is located in male flowers. This pattern suggests that the dark spot of female flowers may function as a fake nectar signal enhancing the attractiveness of these flowers. The experiment of flower choice indicated that pollinators preferred male flowers, visiting them 2.65 times more than the females. Handling time was 3.5 times greater in male flowers than in females. These results indicate a batesian-like mimicry in which rewarding male flowers are models to the mimic non-rewarding females.

FS07.P.20

Pollinator limitation reduces reproductive success in *Bionia pedicellata* (Benth.) L. P. Queiroz, an ornithophilous Fabaceae

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Pollinator limitation is the inefficiency of pollen transfer by pollinators, indicating that reproduction is not limited by energy levels, but through the activity of pollinating vectors. Several factors such as removal efficiency and deposition of pollen on the stigma, pollinator behavior (i.e. pillager/pollinator), floral morphology and frequency of visits may influence the effectiveness of pollinators. In this study we tested the efficiency of pollinators of *Bionia pedicellata*, an ornithophilous Fabaceae, one of the most representative family in the Caatinga vegetation. In addition, we analyzed the phenology, floral biology and breeding system of *B. pedicellata* in PARNA Catimbau from May 2006 to October 2007. Flowering occurred at the end of the rainy season and early dry season, peaking in August. Anthesis lasts three days and the red tubular flowers presented nectar as the main floral resource (53.4 µl of nectar volume with 44% sugar concentration). Pollen viability was 95.81%, with approximately 81,000 pollen grains per flower (P/O=9,975). The floral visitors were hummingbirds *Amazilia* sp., *Chlorostilbon lucidus*, *Eupetomena macroura* (Trochilinae), *Anopetia gounellei* and *Phaethornis pretrei* (Phaethornitinae). Although visited by five species, our analyzes suggest that *B. pedicellata* has a limitation of pollinators (χ^2=13.19, df=1, p<0.0003) with reproductive potential of 22.5% in manual cross-pollination, but naturally with only 2% of fruit-set. This is mainly due to the behavior of the main visitor *C. lucidus* (94.17% of visits), which acts as an occasional pillager. Due to its self-incompatibility (χ^2=5.73, df=1, p=0.016), *Bionia pedicellata* depends on biotic vectors for the pollen flow and consequent sexual reproduction. Although *B. pedicellata* has strategies of asexual reproduction, the maintenance of genetic variability in the population depends on the low efficiency of their pollinators, demonstrating that this biological interaction, although not very efficient, has a relevant role for the species conservation.

FS07.P.21

Flower visits AND FISIOLOGical CHARACTERISTICS of Dombeya wallichii (MALVACEAE) in Sub-Montane Ombrophilous Dense Forest

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Malvaceae family has a variety of species with ornamental interest, especially plants with big inflorescences that produce amounts of nectar. Production of nectar consumes considerable diary photosynthetic production, mainly from leaves near the inflorescence. We have evaluated the difference in number of visits and floral visitors in inflorescences of *Dombeya wallichii* (Lindl.) K. Schum., an arboreal Malvaceae, correlated to the sugar content in inflorescences, to the luminosity and the photosynthetic capacity obtained in the same branch of inflorescence. This study was conducted in 13 plants of a Sub-Montane Ombrophilous Dense Forest fragment, located in Santa Teresa Municipality, Espírito Santo State. The chlorophyll fluorescence has been determined in leaves of 16 inflorescences using Mini-PAM (Walz). The intrinsic Photosynthetic Capacity has been obtained from repeatedly light-response curves performed by growing light pulses and the measurement of effective quantum efficiency. Photosynthetic Capacity has been correlated with sugar concentration quantified by refractometer in each studied inflorescence, previously bagged to avoid nectar visitors. Visitors were observed during five minutes in 9 inflorescences per strata (up to 1.8 m, from 1.9 to 2.5 m, and higher than 2.5 m), a total of 27 inflorescences. We have measured both solar luminosity in each inflorescence observed and sugar concentrations in inflorescences at different strata using refractometer in 9 bagged inflorescences, 3 per strata. Apidae bees are the only visitors of *D. wallichii*. Visitation rates are greater in middle and higher stratum, with no relation to inflorescence incident luminosity. No significant variation in sugar concentration of different stratum has been observed, having no relation to the photosynthetic capacity. Data suggest that carbohydrates transference to nectar could occur integrated in the plant, with the trunk operating as a drain and visitation occurring preferentially in higher branches by reasons of ease access and visitors behavior in forests.

FS07.P.22

Plant-pollinator interactions in restored areas at the Atlantic forest: is the establishment of interactions predicted by flower and insect abundance?

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Plant-animal interactions may be influenced by many factors as the spatio-temporal overlap and species abundance. In this study we evaluated the influence of those factors in the establishment of plant-pollinator networks in restored areas of the Atlantic Forest, Southern Brazil, at different management conditions (natural regeneration and plantation) and stages (four and six years old). During three months, the number of flowers and insect visits at twelve plots was recorded. To test if the occurrence of flowering plants predicted insect occurrence, we performed Mantel correlation between the species compositions at each plot-month. To test if the establishment of interactions was predicted by spatio-temporal overlap between plants and insects, we constructed interaction matrices exclusively predicted by the spatio-temporal co-occurrence of flowers and insects. The correlation between the probability matrices and the interaction matrices was tested by Mantel test. To test if flower and insect abundance influenced the establishment of interactions in our restored areas, the interaction matrices predicted by the abundance were compared to the matrices of observed interactions, by Mantel test. Plant occurrence predicted insect occurrence. Considering all the restored plots, the matrix of observed interactions was correlated to the spatio-temporal overlap of flowers and insects and also to their abundance. The *r* values were similar in both analyses indicating that the factor influencing the correlation is the spatio-temporal overlap between insects and plants. When management conditions were separately considered in the analyses, the interaction matrices were neither correlated to the spatio-temporal overlap between insects and plants nor to their abundance. This indicates that plots heterogeneity within each management condition is low when compared to plots total heterogeneity. Thus, the spatio-temporal overlap between flowering plants and insects predict the establishment of interactions in restored areas of the Atlantic forest when different management conditions and stages are considered in the sample.

FS07.P.23

Do all dishes seem the same? Assessing the pollen-anther visibility to bees

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Pollen has the main function of safe transportation of male gametes from the stamens to stigmas, however pollen-flowers of plants pollinated by bees must also reward their pollinators with pollen. On the other hand, plants pollinated by non pollinivorous vectors should have traits which prevent pollen steal by bees. We investigate here if pollen presentation and conspicuousness to the bees differ between bee-pollinated flowers and flowers pollinated by birds or wind. We collected flowers of 36 species of 20 families (17 melittophilous, 14 ornithophilous, and 5 anemophilous). Each flower was inspected and categorized according to UV reflection properties of pollen/anther and visibility/contrast of these components in relation to the background, that is, the remaining floral parts. Pollen/anther absorbed UV in most melittophilous species, whereas bird-pollinated species showed an opposite pattern. Although male reproductive structures did not absorb UV in bird-pollinated species, their pollen and anthers contrasted to the remaining floral parts, so these flowers may not ensure less conspicuousness to potential pollen robber bees. The wind-pollinated species, however, appear to be effective for escaping from bees, as their pollen and anthers did not absorb UV and did not contrast against the floral background. Therefore, the UV reflection differs between bee-pollinated flowers and those pollinated by birds or wind. Even so we did not find strong evidence that pollen and anthers of bird-pollinated flowers are hidden from bees, such as we found to occur among wind-pollinated flowers. The phylogenetic inertia in the color of pollen and anthers could partially explain why bird-pollinated flowers present reproductive male structures that contrast to flower background.

FS08.P.01

Large-scale pattern of interactions: the case of *Centris* and floral oil producing plants in South America

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Geographical distribution of species can be shaped by four main drivers: abiotic and biotic features, dispersion capabilities and biogeography. These drivers are supposed to influence the distribution of the organisms on different geographical scales: abiotic and biogeographic features have a significant effect on the larger scale processes and biotic features and dispersion, on smaller ones. To discuss the influence of biotic and abiotic features, we analyzed the interactions of oil collecting *Centris* bee species and floral oil producing plants and the abiotic features of their geographic distributional areas in South America. These plants belong to different botanical families and present two kinds of elaiophore (the oil gland): epithelial or trichomatic. We obtained a list of 37 *Centris* and 74 plant interacting species. Their occurrence areas were surveyed in biodiversity data providers mainly and were climatically characterized using GIS tools. We demonstrate that interactions between *Centris* bees and their oil resource plants present a spatial organization in the South America. Interactions with Calceolariaceae and Plantaginaceae species occur in the Andes and in the Southern and Northeastern areas of Brazil, mostly. These areas presented significant lower rates of precipitation. Interaction with Malpighiaceae, Krameriaceae and Orchidaceae occur in different biomes, especially in the Tropical Savannas and Moist Forests. Besides, most of the main interacting species of the major regions are phylogenetically related. Emphasis is given to *Paracentris* subgenus that is closely related to the plant genera presenting trichomatic elaiophores (*Calceolaria* species in the Andes and *Angelonia* in the Brazilian Northeast). Our work contributes to the discussion about the features that shape large-scale geographical distribution, emphasizing the role of interaction.

FS08.P.02

Ecology of interactions between Coragyps atratus (Bechstein, 1793) and Caracara plancus (Miller,JF, 1777) in regions of Uberlândia - MG

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Although seldom reported, necrophagy is a relatively common phenomenon in nature. Among necrophagous vertebrates, scavengers are the only ones who have a diet composed almost exclusively by carcasses. There are five species of scavengers recorded in Brazil and in some Brazilian regions these species can live in sympatry, interacting with each other and with species of Falconiformes. The aims of this study were: to evaluate the use of perches and food resources by necrophagous birds in different areas of Uberlândia city (MG), and to establish the types of interactions (intra- and inter-specific) between the studied populations. The research was performed between December 2006 and December 2007, though field observations were concentrated in the dry period (June to September 2007). Three areas were selected for completion of work (urban environment, urban-rural environment and rural environment). The observations followed the focal animal *ad libitum* model, and were carried out from 9 am to 6 pm. All areas were sampled monthly, totaling 90 hours of observation (30 hours in each area). Two species of necrophagous birds were recorded: *Coragyps atratus*, black vulture and *Caracara plancus*, Crested caracara. The rural-urban environment showed higher frequency of records of scavengers and Crested caracara using perches (5646). The principal component analysis (PCA) indicated that the structural heterogeneity expressed by the quantity and diversity of elements that serve as perches and dormitories for birds, was the main conditioning factor for the concentration of birds in each environment. Moreover, the urban environment served as a deposit of waste and carcass of animals stemming both from urban environments as well as rural environments. Interactions for food were often marked by agonistic interactions, although there were displays which prevent disputes, such as physical postures of warning and production of sounds (including “vocalization”). Interspecific allopreening was recorded at a higher frequency than expected and probably occurs as a way of rapprochement between Crested caracara and black vultures during the formation of mixed flock. These mixed flocks seemed to be favored by the surveillance ability of the Crested caracara and because of its vocalization ability and thus producing scream of warning, useful for the flock.

FS08.P.03

Habitat selection and subsequent experience in a naïve young jumping spider

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The bromeliad-living jumping spider *Psecas chapoda* inhabits almost strictly the bromeliad *Bromelia balansae*. Adults select their hosts basing their choice on architectural features of plants, which is restricted to rosettes having narrow and long leaves. We tested if this specialization has direct genetic basis or if early experience mediate the host choice by this spider. We measured initial host choice responses of naïve spiderlings, and tested the effect of experience on subsequent host choice decision. Selection for hosts had genetic basis, i.e., spiderlings presented similar patterns of host selection than adults. They preferred rosettes having narrow and long leaves (*B. balansae*) over others with wide and short leaves (*A. fasciata*). Individuals early experienced on *B. balansae* chose *B. balansae* over *A. fasciata* in subsequent contact. However, spiderlings early experienced on *A. fasciata* selected both *B. balansae* and *A. fasciata*. These results suggest that *Psecas* presents innate preference for specific host plant architecture, but experience may also play a modest role in host choice decision.

FS08.P.04

Effect of habitat conservation in predation of artificial nests

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Nest predation is considered one of the main factors influencing bird species loss in disturbed habitats. Due to methodological issues, the use of artificial nests has been considered an important tool for bird predation studies. For this reason the aim of this study was to evaluate the effect of habitat conservation on artificial nest predation. The study was conducted in Caparaó National Park, located on the border between Minas Gerais and Espirito Santo states in south-east of Brazil. Three forest fragments were arbitrarily selected encompassing three degrees of anthropogenic disturbance: “high”, “medium” and “low”. A total of 138 nests were handmade using filter paper and some plant material. Inside each nest we put one intact quail egg. In each fragment 46 nests (23 on the ground and 23 in the understory) were placed along one 50m long line transect. All nests were checked after four days and the eggs were considered predated when: eggs were missing, broken or pecked. Our results have shown that out of the 138 eggs, 35 were predated (21 on the ground and 14 in the understory). Regarding the effect of habitat conservation, we found that in transects with "medium" and "high" degree of disturbance the nest predation was significantly higher when compared with habitats with "low" degree of disturbance (χ^2= 136.54; p< 0,001). Conversely there was no difference on nest predation between soil and low vegetation (χ^2= 134.41; p=0.14). Probably some features related to disturbed habitats such as smaller fragment size, bigger isolation from preserved areas and low vegetation cover may facilitate nest discover and access for a great number of generalist predators. It is also important to point out that the decrease of habitat availability for the nest construction can increase nest density and though attract a bigger number of predators.

FS08.P.05

FLUORESCENCE IN TROPICAL CRAB SPIDERS: A FUNCTIONAL AND EVOLUTIONARY APPROACH

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Thomisidae spiders have photoreceptors sensitive to ultraviolet (UV) radiation that consists of radiation with a wavelength smaller than the light visible to humans. When atoms of photoreceptors are exposed to UV rays, there is absorption of these rays and emission of visible radiation also known as fluorescence. Although fluorescence has recently been described in many organisms, little is known about how this property evolved in spiders. In crab spiders (Thomisidae) the evolution of camouflage colors and attraction of prey is an intriguing topic and still largely unexplored, especially regarding tropical species. Several crab spider species are sit-and-wait predators hunting on flowers and could require some degree of crypsis to minimize or avoid being found by floral visitors. In contrast, other crab spider species, sharing plesiomorphic traits (e.g., *Tmarus*), generally do not forage on flowers and their color vary from pale to dark brown. To date, nothing is known about the behavior, coloration and fluorophore concentrations among species that forage on flowers and other types of substrate, nor how these characteristics evolved in Thomisidae. This work specifically investigated the change in concentration and intensity of fluorophore within the family Thomisidae, from the basal genus to the most derived one, if there is a continuum of foraging strategies in the group which may be related to color and concentration of fluorophores. Our preliminary results showed that the taxa of brown coloration shared similar fluorescence spectrum and were grouped within a monophyletic branch. In contrast, those that use flowers for foraging presented variable patterns of spectra fluorescence, and most of them presented higher spectral intensity than the brown ones. The fluorescence varied amongst the different Thomisidae species` and field experiments prove that fluorescence is related with camouflage and prey attraction. This study effectively demonstrates that fluorescence intensity is variable among taxa of Thomisidae.

Keywords: fluorophores, Thomisidae, evolution of color, fluorescence, UV, pollinators

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FS08.P.06

Galling as ecosystem engineer

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Ecosystem engineers (EEs) are organisms that directly or indirectly modulate the availability of resources to other species, by changing the physical state of biotic or abiotic materials. Here, we studied a microlepidopteran (*Palaeomystella* sp.) gall-maker that induces rosette-like galls on the apical meristem of *Tibouchina* sp. (Melastomataceae). This study aims to test the role of gall-maker as an EEs through the comparison of richness, abundance, and trophic structure between ungalled and galled branches of *Tibouchina*. For each plant (N = 25) were selected three branches (treatments): “ungalled”, “young galled”, and “old galled”. Branches were individual removed to plastic bags for laboratory sorting. Arthropods were counted, morphotyped, and classified according to trophic level (herbivorous, predator, or detritivorous). Abundance of arthropods was similar between ungalled and young galled, but was higher in old galled branches. Arthropod richness was higher in both young and old galls, which in ungalled branches. Regarding the trophic level, abundance and richness of detritivorous was higher in old galled, followed by young and ungalled branches. Young galled branches had the higher abundance of herbivores, and predators have no difference between treatments. Probably old galled branches had the greater detritivorous abundance due to gall decomposition that provides both shelter and adequate food for this guild. Moreover, young galls traits seem to promote optimal conditions for many herbivores species probably by means of better food quality (e.g. young leaves). These findings indicate, at least for the present system, that a gall-maker can shape all the arthropod trophic structure and though acting as a truly ecosystem engineer.

FS08.P.07

Larval preference and performance of *Dryas iulia* (Lepidoptera, Nymphalidae, Heliconiini) on different species of Passifloraceae

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Dryas iulia is a common Neotropical nymphalid butterfly in South America. This species has a close relationship with Passifloraceae, specially with the genus *Passiflora*. The aims of this work were to evaluate: 1- D. iulia caterpillar differential feeding preference on four Passiflora species (*P. misera, P. suberosa, P. pohlii* and *P. edulis*). These species occur in sympatry in the study region ; 2- the differential performance of *D. iulia* caterpillar on *P. misera* and on *P. suberosa;* 3- the influence of nitrogen and water content and trichome density in the four passiflora's leaves in the feeding preference and larval performance. To test the differential feeding preference, two leaf discs of each *Passiflora* were offered to third larval instar. After 20 hours, the discs consumed areas were analyzed. *P. misera* was the species mostly preferred by *D. iulia* caterpillars, followed by *P. suberosa* and *P. pohlii*. We then selected the species *P. misera* and *P. suberosa* to evaluate the immature stages performance. The parameters used to evaluate the performance between the species and instars were: development time (days), survival, gain weight (g), consumed leaf mass (g), nutritional indices: relative growth rate (RGR), relative consumption rate (RCR) and efficiency of conversion of ingested food (ECI), pupal weight and pupal stage (days). The data were obtained by daily observations beginning with first larval instar until adult emergence. The caterpillars reared on *P. misera* had the best performance for the parameters evaluated. The results indicate that *P. misera* represents the best host where *D. iulia* achieve higher performance under the experimental conditions. We thank FAPEMIG and CNPq for financial support.

FS08.P.08

STATUS OF KNOWLEDGE ON HELMINTHS OF AMPHIBIANS IN SOUTH AMERICA

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Parasitological studies with helminths of amphibians in South America have been increased in the past few years, with many new records of hosts and/or localities, and description of several new species. We reviewed summarized data published from 1925 to 2012, excluding material from the called “gray literature”, i.e., records of unpublished thesis or scientific meetings. We analyzed the number of species, amphibian host species, and geographic records already reported for the groups Nematoda, Cestoda, Trematoda, Pentastomida and Acanthocephala,. We found 240 studies on helminth parasites of amphibians in South America that showed 257 helminth species distributed as follow: 56 (23.3%) records with 53 spp. in Argentina, 115 (47.9%) with 124 spp. in Brazil, six (2.5%) with five spp. in Chile, eight (3.3%) with 11 spp. in Colombia, 13 (5.4%) with 18 spp. in Equador, one (0.4%) with two spp. in French Guiana, 19 (7.9%) with 38 spp. in Paraguay, 11 (4.6%) with 12 spp. in Peru, six (2.5%) with 23 spp. in Uruguay, and five (2.1%) with ten spp. in Venezuela. The published papers recorded helminths for 133 amphibian species. Nematoda included 136 species distributed in 25 families; Trematoda, 103 species distributed in 20 families; Cestoda, ten species distributed in five families; and Acanthocephala, eight species in only one family. There are no records of pentastomids in amphibians in South America. Brazil has the highest number of nematode species, while Argentina has the highest number of trematode species. These data showed that studies of amphibian parasites are focused in Brazil and Argentina. Despite their potential negative effects on the hosts, parasites may be used for studies of biological conservation and evolutionary and ecological impacts of parasitism.

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FS08.P.09

Nutrient loadings may explain termite nest geophagy by parakeets

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The consumption of soil has been recorded by a wide range of vertebrates. Several benefits has been proposed to explain geophagy, including mineral supplementation, attenuation of dietary toxins, mechanical aid to digestion, pH buffering, and treatment for parasites and diarrhea. Indeed, the characteristics of the soil consumed can indicate its physiological function. Clay-licks are the main source of soil to geophagy by mammals and birds. However, consumption of termite nest soil was registered just for some African primate species. For birds, termites are important nest sites, and the Yellow-chevroned Parakeet, *Brotogeris chiriri*, is a termite cavity nester. We observed termite soil eating by this species during the nest digging in arboreal termites in a fragment of Cerrado in Central Brazil. Once the geophagy by parrots is usually associated with ground soil, we hypothesized that the termite soil would have nutrient loadings greater than the ground soil. We selected six arboreal termites in which we observed geophagy by *B. chiriri*, and collected samples of termite and ground soil. We performed an analysis of macro and micronutrients. We used paired t-test to compare the two types of soil. Termite soil had significantly higher concentrations of organic matter, K, Mg, Al, H+Al, S; and lower pH, and concentrations of Fe and Cu. The high concentrations of macronutrients suggest that termite soil may be more effective to mineral supplementation than ground soil. The higher value of H+Al (Cation Exchange Capacity) indicates that termite soil had a higher capacity to bind positively charged toxin, attenuating the negative effects of toxins commonly present in the diet of parrots. The low pH in termite soil can contribute to reduce stomach acidity. In this way, our results suggest that termite soil eating may bring more benefits than ground soil, which can explain the geophagy in arboreal termites.

FS08.P.10

Clutch size adjustment and the preference for big leaves in the phytophagous insect *Mechanitis polymnia* (Lepidoptera, Ithominae)

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Optimal clutch size has been studied in numerous vertebrates, especially birds, but in invertebrates is poorly documented. In this study we evaluated clutch-size adjustment by females of butterfly *Mechanitis polymnia* according to leaf area and if there is preference for leaf size. We made observations in the Serra do Japi, Jundiaí-SP, Brazil by searching host plants for eggs along a forest edge from February to April of 2012. *M. polymnia* lay a clutch of white eggs on the upper leaf suface on four species of Solanaceae: *Solanum robustum*, *S. mauritianum*, *S. paniculatum*, *S. variabile*. Before data collection we did a preliminary investigation to calculate leaf area using leaf length of leaves. We used Image J software to obtain area of ten scanned leaves of each species of plant and performed linear regressions between leaf length and area. We used the regression equations to estimate leaf area using only length of leaves measured in the field. When we found eggs, the host plant was identified, the number of eggs in the egg cluster counted, and the length of each leaf on the plant measured. We found that the number of eggs was positively related to plant leaf area. Therefore plants with smaller leaf areas had fewer eggs than plants with larger leaf areas (linear regression, r2=0.64, $p<0.01$, N=54). Females preferred to lay eggs on the biggest leaves of plants (t-test, t=4.23, p=0.02, N=308). In this study we show that females of *M. polymnia* prior to oviposition seem able to assess information about features of host which are possibly related to larval survival.

FS08.P.11

Does the distance from riparian forest determine the abundance of mistletoes?

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Phoradendron affini (Pohl. ex DC) is a mistletoe dispersed by birds. In the Pantanal, it often uses individuals of the specie *Tabebuia aurea* (Benth & Hook. F. ex S.Moore) as hosts. The objective of this study was to examine whether proximity to the riparian forest is regulating factor to the abundance of *P. affini* in *T.aurea*. It is expected a greater flow of frugivorous birds in regions closer to the riparian forest, by the reason of its greater abundance of resources. Thus it is expected that the dispersion of *P. affini* occurs more frenquently in this region of the heavy traffic dispersal. The study was conducted in a formation area monospecific of *T. aurea*, known popularly as paratudal, in São Bento farm, near Base Study of the Pantanal (BEP-UFMS), Miranda's Pantanal, Corumbá. Data were collected between October and November 2011. 105 individuals *T. aurea* were used as sample . These ones had their location marked on the GPS receiver and the number of mistletoe *P. affini* counted. In Google Earth distances were measured for each individual of *T. aurea* the riparian forest, and was performed linear regression of these values with the number of parasites of each tree. Negative relationship was found ($F = 28,947$, $p < 0.0001$, $R^2 = 0.2194$, $n = 105$) between the distance of riparian vegetation and the number of mistletoe *P. affini*. Thus the closer the host *T. aurea* were of riparian forest, increased infestation by *P. affini*. However the riparian forest may be functioning as a source of dispersing birds, since this one has a great number of frugivorous species.

FS08.P.12

Modeling the interaction of homogeneous and heterogeneous risk of predation in the feeding behavior of rodents

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Several studies have described anti-predator behavior in habitats with more than one predator. However fewer studies have analyzed the interaction of two predators in preys' habitat selection. Among those none, addressed predators that induce homogeneous risk in the landscape. Therefore, to understand how preys' habitat selection under several predators the interaction of homogeneous and heterogeneous risk must be examined.

Therefore, I extended the model of risk of predation to consider the homogeneous risk of predation, by inserting two terms: The risk of the homogeneous predator inside and outside patch. Then, following the original model, I derived the optimal resource consumption by a forager seeking to maximize resources and survivability.

To predict the interaction between the two risks this simulation was applied: 100 patches with the amount of resources following a normal distribution(μ=15,σ=4, based on *Thrichomys pachyurus*) were created;The forager should feed on a random patch until it is unprofitable. The risk in each patch was determined by two methods: (1) each patch had two risk values. One following a normal distribution (heterogeneous), and the other is equal in all patchs (homogeneous); (2) There was only one risk value per patch, following a normal distribution. Its variance represented the degree of homogeneity.The simulation was reran with different values of mean (range:1~15) and variance(1~8) of risk.

Our results indicate a higher homogeneity risk leads to more time on each patch, on average. This result found support on literature evidence. We also point out that risk heterogeneity can decrease patch use even when it is lower than the homogeneous fear. This indicates that rare predator may have a disproportional effect on prey's habitat selection.

FS08.P.13

HEMOPARASITES IN ANURANS AND REPTILES IN THE CERRADO-PANTANAL REGIONS, MATO GROSSO DO SUL STATE – BRAZIL

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The Cerrado-Pantanal areas presents a mosaico of landscapes associated with the hydrological regime resulting in a complex ecosystem, that shelter a herpetofauna with great diversity along this gradients. The aim of this study was to register the ocurrence and frequence of hemoparasites, in communities of anurans and reptiles in the regions of: Miranda-Abobral, Nhecolândia and Serra da Bodoquena, in the State of Mato Grosso do Sul. The animals were captured by pitffal's traps or active searching, were done in a unique expedition, in each sub-region, in the period of January to May of 2011; with duration of, at least, three nights per expedition . The captured animals had the blood samples collected through cardiac or venipuncture, using anticoagulants (EDTA), the samples were processed by microhematocrit and thin blood smears slides, stained according to Giemsa. To identification of the hematozoas and morphometric studies were performed under light microscopy with image analysis system (Leica Aplication ™ Suite V 3.5 - Leica ®). A total of 106 animals were examined, of which 32 (30.18%) were infected with hemoparasites, with medium intensity ± 0.0937. The genus *Trypanosoma* spp. showed higher relative frequency (56.25%) compared with other protozoa, occurring in 18 anurans hosts (*Leptodactylus chaquensis, L. podicipinus* and *Trachycephalus venulosus*). The *Plasmodium* spp. had a frequency on eigth (25%) animals, but covering a wider range of hosts such as lizards (*Cnemidophus occellifer*, *Mabuya guaporicola* and *Micrablepharus maximiliani*), snakes (*Liophys poecilogyrus* and *L. typhlus*) and frog (*L. chaquensis*). The last observed parasite was the *Hepatozoon* sp. occurring in the anurans *L. chaquensis* and *Rhinella schneideri* and in the snakes *Bothrops matogrossensis* and *L. poecilogyrus*. Regarding the studied regions, the Pantanal of Nhecolândia showed the herpetofauna with highest number of parasited individuals.

FS08.P.14

Longitudinal study of hantavirus hosts in southern Brazil

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Hantavirus cardio-pulmonary syndrome (HCPS) is an emerging disease transmitted to humans through aerosols of rodent excreta. Hantavirus outbreaks usually occur in impoverished habitats, where some generalist/opportunistic host species may have their abundance increased. In order to investigate the relationship between rodent diversity and prevalence of infection by hantavirus in rodents, we conducted a longitudinal study of rodent diversityin southern Brazil. We sampled six sites with different levels of disturbance, from preserved native Araucaria areas to *Pinus* cultivated sites. The study areas were classified according to microhabitat variables and spatial analysis and rodent sampling was conducted every three months from Dec/2009 to Dec/2011. Animals were karyotyped to confirm the morphological identification and their serum and tissue samples were submitted to IgG enzyme-linked immunosorbent assay (ELISA) and RT-PCR analysis, respectively. During the first year of study, 680 individuals of 10 rodent species were captured: *Akodon serrensis* (n=266), *Oxymycterus judex* (n=140), *A. montensis* (n=137), *A. paranaensis* (n=47), *Oligoryzomys nigripes* (n=38), *Thaptomys nigrita* (n=37), *Sooretamys angouya* (n=9), *Delomys dorsalis* (n=2), *Nectomys squamipes* (n=2) and *Oecomys* sp. (n=2).Six specimens of *A. montensis*, six *A. paranaensis*, two *A. serrensis* and one *O. nigripes* were seropositive for hantavirus infection. There was a positive correlation between species evenness and hantavirus prevalence (r=0.899; p=0.015), suggesting the prevalence increases on areas with more homogeneous abundances. There was no correlation between hantavirus prevalence and species richness or diversity. The six most abundant species occurred in all areas. Although there was no clear relationship between prevalence and disturbance levels, relative abundance of rodents seems to explain differences in hantavirus prevalence amongst areas. *A. serrensis* and *A. montensis* showed spatial segregation (r=-0.276; p=0.001) and in three areas where *A. serrensis* was the most abundant species, the overall prevalence was lower than in other areas where its abundance was similar to *A. montensis*.

FS08.P.15

The novel diet of an isolated group of blond capuchin (*Cebus flavius*) in very small patches of forest in the Pernambuco Endemism Center, northeastern Brazil

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The genus *Cebus* is known for its adaptive success due to a generalist diet and opportunism which enable these animals to survive when resources are extremely limited. In this study therefore we aimed to analyze the diet of a blond capuchin group (*Cebus flavius*) in four very small forest fragments (from 8.28 to 26.58 ha) connected by a swamp (103.5ha), which sum 176.21ha, immersed in a sugarcane matrix at Salgado Mill in Ipojuca/PE. Systematic observations were carried out by using *Ad Libitum* sampling method from December 2008 to May 2009, five days a month, when we obtained 120 food records. Eleven plant species were identified in the blond capuchin diet, among which, seven were native and four introduced, the latter accounting for 55.6% (n=40) of all plant food records. Fruits were the most consumed (n=54; 75.1% of the plant items and 45% of all food records), and the African palm *Elaeis guineenses* comprised 61.1% of all the fruit consumed, followed by native bulandi fruits (*Symphonia globulifera*), with 12.92%. Of all non fruit plant items consumed (n=18), bulandi flowers comprised 44.44%, sugarcane (*Saccharum officinarum*) 27.78%, aninga buds (*Montrichardia linifera)* 22.22%, and the Amazonian rubber tree seeds (*Hevea brasiliensis*) comprises 5.56%. In the dry season the animals fed more (66.67%; n=80), fruits and bulandi flowers were the most consumed (respectively 51.25% and 10% of dry season records). Invertebrate food comprised 15% (n=18) of the group diet (9.17% in the dry season). We conclude that this group adapted to a novel diet, in which introduced plant species have become more important than native ones, and that the fruit of the African palm became a key resource for the group. This study highlighted the great need to restore their habitat, especially with the re-introduction of native food trees if this species should survive.

FS08.P.16

Architecture of *Tabebuia aurea* (Bignoneaceae) and parasitism by *Phoradendron affini* (Loranthaceae)

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Phoradendron affini (Pohl. ex DC) is a mistletoe dispersed by birds. In addition to the disperser behavior, other factors related to the structure of the host may influence the establishment of this. This species often uses individuals of the species *Tabebuia aurea* (Benth & Hook. F. ex S.Moore) as hosts in the Pantanal. The objective was to analyze the relationship between parameters of the architecture of *T. aurea* and the occurrence of *P. affine*. The study was conducted in September 2011 in a monospecific formation area of *T. aurea*, in the Pantanal region of Miranda. Were used as variables for the individuals' architecture: diameter at breast height (DAP) and larger and smaller canopy diameter. As a control, we used, non-infected individuals with greater proximity to its peer with mistletoe. To analyze the architecture dissimilarity between parasitized and plants, it was done a Principal Component Analysis (PCA) with the three variables. Through the axis values of PCA greater explanation, were used the greater projection variable to compare parasitized and not parasitized plants through the t-Student test. 40 individuals of *T. aurea* were sampled, 20 parasitized and 20 not parasitized. We found that the architecture of *T. aurea* tend to be dissimilar, however it was not possible to distinguish coherent groups. The major variable in the projection for the PCA Axis1 was the larger diameter of the canopy ($r = 0.6338$). The t-Student test showed that the mean diameter of the canopy were significantly higher in the group with mistletoe ($t = 3.15$, $p = 0.02$, $gl = 19$). Trees with larger crowns and larger DAP are possibly older and larger, and this implies a longer exposure to mistletoe and also increases suitable sites available to the foraging of dispersal, and thus would be larger the chances of seed deposition.

FS08.P.17

What really matters for red-rumped agoutis, *Dasyprocta leporina*, habitat selection in a mosaic of vegetation types in northern Brazilian Amazonia?

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Agoutis are relatively common rodents in northern Brazilian Amazonia. Seeds and fruit pulp available on the ground are the main food resources for this species and determine spatio-temporal variation in agouti population abundances. This study analyzes the information on individual density and biomass of agoutis (*Dasyprocta leporina*) in a mosaic of forest types of Amazonian rainforest in Maracá Ecological Station, northernmost Brazilian Amazonia. Data were collected during a year (between April 1997 and March 1998) through line-transects conducted in five forest types: Terra Firme, Mixed, Carrasco, Buritizal and Pau Roxo forests. The highest density estimates were recorded in Pau Roxo forest, with 57.36 ind./km^2, whereas the lowest was Terra Firme forest, with 10.23 ind./km^2. The highest biomass estimates were recorded in Pau Roxo forest, with 242.35 kg/km^2, whereas the lowest was in Terra Firme, with 43.23 kg/km^2. No red-rumped agoutis were recorded in the richest of all forest types, Buritizal forest. Density and biomass proved to be similar in the different seasons in the forest types studied. The high abundance / biomass of competitors in the richest forests affected agoutis ecological abundance so that their highest individual densities were recorded in those considerably poorer forests, which should be a function of higher competitive pressure in those richer forests. Thus, what really matters for the agoutis habitat selection is the avoidance of competition with other larger frugivores.

FS08.P.18

FOLIVORY AND COLLETERS SECRETION IN RUBIACEAE SPECIES FROM SOUTH AMERICAN TROPICAL SEASONAL ECOSYSTEMS

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The interactions among species are deeply related to the evolutionary history of biodiversity. Herbivory was one of the first antagonistic interactions that were established in evolutionary history, both in dry and wet environments. Rubiaceae family is known for its chemical defenses that can act as antiherbivores and for the presence of secretions like mucilage on vegetative apex, that could be related to protective functions against biotic and abiotic factors. The aim of this study was to investigate the secretion occurrence on vegetative apex and the intensity of folivory of two Rubiaceae species, Alibertia concolor from semideciduous forest and Alibertia sessilis from cerrado of São Paulo state. Both vegetation types are under seasonal climate, with a definite dry season. Cerrado has a well-drained, infertile soil, sometimes with high aluminum content that prevents closed forest. However, the semideciduous forest presents a deeper and more fertile soil with a continuous canopy, as well as a shadowy understory. Every apex was checked monthly for the presence of secretion. To estimate the index of herbivory, forty pairs of leaves from five individuals of each species were evaluated monthly from May, 2011 to February, 2012. All the leaves were photographed and the area consumed by herbivores was estimated in relation to the total area, using a software for image analysis. Secretion occurred from July to August in A. concolor, and in August in A. sessilis. This period is the driest, windy and coldest this region, so the secretion can be primarily related to avoidance of abiotic constrains. The mean indexes of herbivory were higher during springtime, A. sessilis (20,21+7,0) and A. concolor (14,15+1,88). Nevertheless, we verified a reduction in the folivory in both species immediately after the period when the apexes were covered with secretion, suggesting a secondary role of secretion related to the biotic interactions.

FS09.OC.01

Gender matters! A clue to untangle regeneration processes and mechanisms in tropical dry forests

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Regeneration processes and mechanisms are poorly understood for tropical dry forests (TDF) and here we present information on a plant-plant facilitation process that apparently helps to structure the plant community in this ecosystem. In Chamela, Mexico, along the dry season, the dioecious tree species *Spondias purpurea* produces flowers and fleshy drupes which provide refuge and food to many frugivorous animals under water stress, when other plant species do not. Beneath and away from the canopy of male and female *S. purpurea* trees we determined the standing density, species richness and dispersal syndrome of woody seedlings (*i.e.*, trees and shrubs; 10-100 cm tall) recruited. We also sampled all neighboring adult trees to determine their influence on seedling composition. Overall, the standing density and richness of seedlings was significantly greater beneath the canopy of female trees than anywhere else with greater richness and abundance of zoochorous species. In addition, seedling species composition beneath *S. purpurea* females showed to differ from the rest of the locations and from neighboring adult trees. These differences suggest that animal activity on *S. purpurea* affects canopy architecture and the conditions of the understory where seeds germinate and seedlings establish. Results showed a directional dispersal bias towards *S. purpurea* females which may act as regeneration *loci* in this threatened TDF ecosystem.

FS09.OC.02

Nurse plant effect is driven by shade in a subtropical coastal dune: implications for restoration practices

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The proximity of adult neighbors often increases the performance of wood seedlings under harsh environmental conditions. However, few studies have elucidated the mechanisms underlying this nurse plant effect. We tested, through manipulative field experiments, if shading drove the known nurse effect of adults of the tree *Guapira opposita* on seedling performance of another tree species, *Ternstroemia brasiliensis*, in a subtropical coastal dune. Additionally, we tested if the potential shade-driven facilitation became more intense as stress increased. Assuming that distance from the seashore is a surrogate for stress intensity, at three distinct distances from the seashore we transplanted *T. brasiliensis* seedlings to three neighbor treatments: under *G. opposita* crown, under shade mimic, and control treatment with no neighbor. Regardless of distance from the seashore, after a year the odds of *T. brasiliensis* seedlings survival was twice under *G. opposita* and shade mimic than in control treatment, indicating that the nurse effect of *G. opposita* is, at least partially, driven by shade. However, neighbor treatment did not affect seedlings growth. Overall, this study highlights the potential of nurse plants and artificial shade as techniques to help the establishment of woody seedlings transplanted to restore degraded coastal dunes.

FS09.OC.03

Short-term vegetation regeneration after fire in tropical and subtropical grasslands

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Brazilian tropical and subtropical grasslands are constantly under disturbance influence and fire is a common factor affecting vegetation dynamics and diversity. Although fire is a controversial issue in Brazil it could be an alternative as management tool for these grasslands. Due to the lack of studies, little is known about the fire effects on vegetation regeneration in both tropical and subtropical grasslands. Thus, the aim of this study was to investigate aboveground biomass regeneration of these grasslands in a short-term after experimental fires. We conducted samplings in North (Tocantins – tropical grasslands) and South of Brazil (Rio Grande do Sul – subtropical grasslands). We sampled aboveground biomass in five tropical and seven subtropical experimental plots (0.25x0.25m, 5 samples/plot). In tropical grasslands, we sampled before fire, and 6, 12 and 18 months after fire. In subtropical grasslands, biomass sampling was conducted before, 3, 6 and 12 months after fire. Biomass was separated in different functional groups, dried (70ºC, 3 days) and weighed. In subtropical grasslands, 20% of the total biomass recovered one year after fire. Forb biomass tended to increase just after fire but no significant differences could be found between the times of observation. Biomass of graminoids and shrubs decreased just after fire but tended to increase 6 months after experiments. Biomass regeneration was faster in tropical grasslands and one year after fire, the amount of biomass was the same as before experiments. Forb biomass was also enhanced by fire, and a greater effect of seasonality was observed in the regeneration of tropical grasslands vegetation. Our results show very fast aboveground biomass regeneration in tropical grasslands just after fire. and short-term positive effect of fire on forb biomass both in tropical and subtropical grasslands.

FS09.OC.04

NURSE PLANTS ARE NOT ENOUGH: INSIGHTS ON RESTORATION OF BRAZILIAN SEMI-ARID VEGETATION

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The Caatinga vegetation is a Brazilian semi-arid ecosystem, which is poorly studied, and has been suffering intense degradation and desertification. We performed field experiments in a degraded Caatinga area to test if plant facilitation could drive community restoration. We studied the interaction outcome between three pioneer tree species (potential nurse plants) and five tree species target for restoration. Experiments were performed in a split-plot design, with eight blocks, where groups of seeds and seedlings of each target species were introduced under (nurse) and far from the canopy of nurse plants (no nurse). No nurse areas were randomly chosen from a pool of adjacent open areas available within a 7 m range from the nurse plant. We also registered richness, abundance and composition of woody species regeneration in 3 x 3 m plots in nurse and no nurse replicates. Richness and abundance of woody seedlings regenerating naturally under nurse plants were three times higher than in open areas. Species composition was similar among nurse plants but significantly different between open areas and nurses, with three endemic and two endangered species found only under nurses. All nurse species improved significantly seed germination, seedling establishment and survival of all target species. However, nurse species differ in the way they influenced seedling growth. While *Poincianela microphylla* showed good facilitation capability, *Mimosa tenuiflora* tended to compete with targets during growth phase. Although strong facilitation occurred, all experimentally introduced plants died within six months due to severe drought conditions. We conclude that facilitation by pioneer trees is a strong force governing recruitment of native species in degraded Caatinga, Additionally, other factors such as the identity of nurse species and water availability can strongly influence recruitment. Our findings highlight that the combination of nurse plants and irrigation are essential tools for restoration programs in degraded Caatinga.

FS09.OC.05

Restoration of Mauritia flexuosa swamps in the Peruvian Amazon

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The *aguaje (buriti* in Portuguese) palm is an economically important tree that occurs throughout the Amazon Basin. The palm is used by people for thatch, fibers, several minor products, and most importantly fruit, which is mostly harvested for regional and local markets. This species is not only important to people, but is a key resource for wildlife, including many arboreal and terrestrial mammals and birds. In the Iquitos region of Peru (Loreto province), many *aguajales* (*buritizais*, palm swamps) have been damaged due to destructive harvesting practices of *aguaje* for its fruit. Predatory harvesting has resulted in the planting of the palm in agroforestry systems as a means of reducing harvesting pressure on wild resources. However, the intended use of fruits in agroforestry gardens is for humans, and these systems do not address the maintenance of the resource for wildlife. In this paper, the author examines the potential restoration of damaged *aguajales* in order to restore an important resource for wildlife and people.

FS09.OC.06

MULTITAXA DIVERSITY IN RESTORED RAINFORESTS

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Proximity to a forest source can greatly improve the likelihood of flora and fauna colonization in restored forest areas. However, there is still a lack of information on the possible differences between taxa regarding their capability of colonization. We investigated diversity patterns of 15 taxonomic groups after 4 decades that forests have been restored from agricultural fields. Surveys of mammals, birds, frogs, butterflies, dung beetles, insect galls, spiders, opiliones, flatworms, trees, epiphytic ferns, epiphytic angiosperms, lichens and fungi were performed in three replicates of both native Araucaria Forests and Restored forest areas in south Brazil. We used null models to investigate if patterns of random colonization would differ between taxonomic groups. Taking into account all taxonomic groups we registered 774 species and 109,761 individuals. In total, 541 species were found in the native forest and 503 species were found in restored areas. The average abundance was three times higher in forests compared to restored areas ($F_{1,4}$=93.2; p=0.001) but there was no significant difference in average species richness between areas. When looking at average richness for each taxa separately we found that most species show similar patterns of richness between native forests and restored areas. Exceptions were flatworms and epiphytic angiosperms that showed lower richness in restored areas and lichens and fungi that showed higher richness in restored areas. Looking at species similarity between restored and forest areas we found that mammals, butterflies, dung beetles and plants were the most efficient colonizers on restored areas (percentage of forest species: 89%,87%, 77% and 73% respectively), while fungi and epiphytic angiosperms were the least efficient (percentage of forest species: 26%,24%). We conclude that species differ in the way they colonize restored areas and discuss how restoration practices should target taxonomic groups that have lower colonization skills.

FS09.P.01

Landscape-level regeneration of landslides in the Sierra de Las Minas of Guatemala

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Landslides represent a natural disturbance in mountainous regions where they contribute both to the removal of vegetation and soil, and regeneration of new substrates upon which ecosystems develop. The mechanisms underlying landslide regeneration are relatively well known at small scales yet the same is not true at large scales where their impact is greatest. Here we examine the spatio-temporal distribution of landslides in the Sierra de Las Minas of Guatemala (SLM) as a function of topography to address two questions. First, what is the relationship between landslide occurrence, topography, and land use? Second, how do these variables influence landslide regeneration?

To answer these questions we digitized landslide scars appearing in aerial imagery collected in 1999, 2006, and 2010. The 1999 imagery was used to map landslides triggered by Hurricane Mitch in 1998. The 2006 and 2010 imagery in combination with ground-truthing was used to examine the extent to which the 1998 landslides had recovered and to map new scars. The number and size of landslide scars differed between the northern-wet and the southern-wet to dry slopes of SLM yet on both sides they concentrated at elevations >1600m. On the northern-wet slope most landslides were found on east-facing aspects, yet this relationship was not observed in the southern-mesic to dry slope. After 14 years, landslides on the northern slope exhibited a greater vegetation cover than those on the southern slope. Two non-mutually exclusive hypotheses may explain this observation. First, landslide regeneration on the southern-mesic slope is affected by the re-occurrence of landsliding. Second, exposure to drier climatic conditions limits regeneration. Landslide regeneration may play an important role in maintaining mountainous habitat diversity. Therefore, it can become key for understanding the large-scale dynamics of montane ecosystems.

FS09.P.02

Soil restoration potential of four tree species in a seasonal tropical dry forest in Morelos, Mexico

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Conservation and restoration of degraded seasonally tropical dry forests (STDF) must be a high priority and in order to reduce their deterioration it is crucial to study the ecological aspects of their original species. Tree litterfall and its subsequent decomposition are two essential ecological processes that contribute to the soil nutrient supply, regulate the energy flux and the nutrient cycling. Then, these processes exert considerable influence on the restoration of a degraded site's soil. The present study was conducted to evaluate the dynamics of litter production, decomposition and nutrient concentration in four STDF native tree multi-purpose species that are strongly used by local people, growing in a 10 years forest plantation (*Crescentia alata, Pithecellobium dulce, Eysenhardtia polystachya, Leucaena leucocephala).* The main objective is to generate information for the restoration of degraded soils. *Pithecellobium* was the species that provided most litterfall amount. There was a high percentage of N and P in the litterfall in the rain season for all four species while the percentage of other nutrients varied with the season and species. The potential nutrient input to the soil (nutrients % x literfall amount), in order of magnitude of these species was the same in both seasons: Ca>N>K>Mg>P. Regarding organic matter decomposition, after 398 days, the average percentage of dry weight in the leaf litterfall and the K constant decomposition was significantly different among species. All species showed a very fast litterfall weight loss in the first 183 days of environment exposition, coinciding with the rainy season (May to November). The C/N ratio was highest in *Crescentia* and lowest in *Leucaena* and *Eysenhardtia*. *Leucaena* exhibited the lower retention time of nutrients and more agile biogeochemical cycle.

FS09.P.03

RESTORATION OF COASTAL SAND DUNES VEGETATION DEGRADATED BY BUGGYS IN BRAZIL

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Coastal dunes are environments that perform important ecosystems functions, besides their great aesthetic value for touristic activities. Because its fragility, is urgent the development of restoration programs to reverse this critical situation. Restoration methods described for coastal dunes are still incomplete and rarely incorporate into your design recent scientific information of ecological processes, functioning and plant community structure. The study was conducted at the Environmental Protection Area Jenipabu between Extremoz and Natal; municipalities of RN, Brazil. To test the facilitation effects of the vegetation and the techniques of sand retention on the survival of colonizing plants, two field experiments were carried out. Seventy-two seedlings of *Canavalia maritima*, produced in a greenhouse, were transplanted to a degraded dune area. The experimental design tried to test the effect of vegetation and the use of coconut vegetable mesh on seedlings survival and growth. The second experiment (outside vegetation only) intended to test the techniques of sand retention and the use of vegetable mesh as a facilitation mechanism for the lateral expansion of the vegetation patches, comparing the establishment success of germinated seeds (400) and transplanted seedlings (40) of *C. maritima*. Extreme seedling mortality occurred due to factors such as sand burial, trampling and dry. Plant growth was affected by vegetation and seed germination rate was positively influenced by pre-soaking treatment. Moreover, the survival probability was slightly affected by vegetation in first experiment and by use of vegetable mesh and water in the second. We conclude that despite the difficulty of restoring coastal dunes, there are evidences of facilitation process as a structuring mechanism of plant community and also that the use of a large amount of seeds and seedlings could accelerate the restoration process for these dunes.

FS09.P.04

Short-term natural regeneration in restoration areas in southern Brazil

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One of the main objectives of restoration of degraded areas is the recovery of ecosystems. That is the aim of a project for the riparian vegetation of Machadinho Hydroelectric Plant, in season forest, located in the Uruguay River, southern Brazil. To achieve that, we implemented intervention activities with planting (in 2010) on areas around the reservoir, divided into fragments, classified into two physiognomies: brushwood and pasture. Each physiognomy received three different kinds of planting (treatments), according to size and forest proximity of fragments. The treatments differ in intensity of planting and design: low (450/ha, in nucleus), medium (625/ha, in lines), high (900/ha, in nucleus) and control (without planting). Through monitoring carried out in two years (2011 and 2012), we evaluated the natural regeneration of 60 plots of 4 x 4m, divided into 20 fragments. In both physiognomies, areas of planting suffered reduction in the number of individuals and species, while in control areas there was a tendency of increase. Furthermore, we observed that there was an inverse relation between number of regenerating individuals and grass cover (manly *Eriochloa* sp.) and a direct relation between individuals and woody plants cover higher than 1.30m. We suppose that plantation maintenance activities (weeds clearing, replacement of dead saplings and trampling) may be hindering the natural regeneration. Such management occurred only in the first year of planting. Once saplings achieve a larger size, there might be a significant increase in natural regeneration, through the influence of the upper stratum cover. Another interesting observation was that species composition pattern under low intervention treatment was more similar to control areas than the other two treatments. We concluded that the size of planting area, the forest proximity and the degree of planting management interference are determinant drivers of natural regeneration on areas subjected to restoration.

FS09.P.05

Litter influence on nutrient dynamics and regeneration of native species under eucalipt plantations

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The knowledge that eucalypt leaves is the bulk of the leaf litter reached the hypothesis that it may retard regeneration of native species under eucalipty plantations, causing nutritional limitation. The aim of the present study was to investigate the impact of litter layer removal on nutrients dynamics and seedlings establishment of Atlantic forest species under abandoned eucalypt (*Corymbia citriodora*) stands at União Biological Reserve, Rio de Janeiro, Brazil. The study was carried out in two eucalypt stands abandoned since 1996. Litter was removed monthly since 2004 in five plots (5mx20m). Soil, leaves and litterfall samples were collected in the dry and wet seasons of 2008-2010. All seedlings (5 to 50 cm tall) were tagged in four sub-plots of 5.0 m x 2.5 m. Census were done from Set/04 to Oct/08. There was a negative effect of litter removal on soil nutrients which in general reflected the nutrient status of leaves and leaf-litter of most studied species. The lower soil C/N ratio in response to litter removal confirms that the absence of eucalypt leaves increases organic matter quality. After 14 years of abandonment, the natural regeneration in eucalypt stands is slow and shows characteristics of early succession stage. Two species (*Xylopia sericea* and *Siparuna guianensis*) occurred with great number of individuals in both treatments. The removal of litter favored the regeneration of native species only in the early years of the experiment, suggesting that after four years other factors such as loss of nutrients and decrease in water retention in the topsoil may be affecting more the establishment of seedlings than the quality of the eucalypt litter. In conclusion, the eucalypt plantations litter seems to be an important source of nutrients and its removal may interfere negatively in the establishment of Atlantic forest species.

FS09.P.06

Tree community regeneration along an environmental gradient in a montane Araucaria forest in southern Brazil

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The understanding of the variation of the tree community regeneration along environmental gradients in forest fragments is essential to define strategies for forest conservation and restoration. Thus, the purpose of this study was to evaluate the influence of environmental variables and adult tree component (diameter at breast height - DBH - ≥ 5 cm) on the spatial organization of the natural regeneration in an Araucaria Forest fragment (27°51'36.41"S, 50°11'35,74"W, 990m above sea level), in Southern Brazil. In 50 sampling units, the botanic identification and the height class (h) were recorded for all tree regenerative individuals. The sampling unit sizes were 0.5x10m, 0.5x20m and 1x20m, respectively, for Class 1 (height up to 1 m), Class 2 (height from 1 to 3 m) and Class 3 (height > 3m and DBH < 5cm). In addition, in each plot, variables related to soil, terrain, canopy cover, abundance and richness of trees with DBH ≥ 5 cm were recorded. The relation between the regenerative component and the variables were analyzed using a Canonical Correspondence Analysis (CCA). The survey totaled 33.870 ind.ha^{-1} (Class 1: 26,480 ind.ha^{-1}, Class 2: 5,600 in.ha^{-1} and Class 3: 1,790 ind.ha^{-1}). A total of 33 botanical families, 55 genera and 79 regenerative species was found. The richest family was Myrtaceae, with 20 species. The most abundant species in Class 1 was *Myrsine umbellata* Mart. (2.640 ind.ha-1). In Class 2 and 3, the most important species was *Casearia decandra* Jacq., with 460 ind.ha-^{1} and 210 ind.ha^{-1}, respectively. Overall results showed little influence of the analyzed variables on regenerative component spatial organization, suggesting the prevalence of other non-measured factors, such as propagule dispersal, inter and intra-competition, herbivory and predation.

FS09.P.07

Diameter structure of *Cupania vernalis* Cambess (Sapindaceae) regenerating compartment in a Montana Semideciduous Forest in Lavras – MG

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Diameter structure study of plant species provides knowledge about species behavior in the community over time. A diameter distribution study was conducted in a population of *Cupania virnalis* regenerating compartment in a fragment, called Substation Forest, in Lavras - MG. It has an area of approximately 8 ha and it is located on Federal University of Lavras (21 ° 13'17 "S and 44 º 57'47" W). 49 plots with 20m x 20m size were used. In each, a subplot of 7m x 7m, where all *C. vernalis* regenerants individuals with a diameter between 1 and 15 cm were measured with a digital caliper and height was measured with a graduated tape. The results were processed using the software Microsoft Office Excel 2007. The diameters were divided into class I (1.00 to 5.44 cm), class II (5.45 to 9.89 cm), class III (9.90 to 14.34 cm), class IV (14.35 to 18.79cm) and class V (18.79 to 23.20 cm). Classes I and II had a greater number of subjects with 97 and 9, respectively. Through frequency histogram, there is a trend behavior to which inverted J, what shows there are conditions for specie development. Such studies are important because they promote knowledge about species ecological behavior, which contributes to degraded area recovery and nature conservation.

Keywords: conservation, ecology, plant species.

FS10.P.01

Species extinction following habitat loss – deterministic or random? Beta-diversity patterns across landscapes and fragments

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Most theoretical models on the effects of habitat loss assume that species loss is mainly stochastic, caused by the increased chance of extinction of small populations. Thus, despite the large number of empirical studies on the effects of habitat loss, most studies focus on species numbers (alpha or gamma diversity) rather than species composition. Recently, however, the use of beta-diversity measures, which include information on species composition, together with appropriate null models has been advocated as a way of testing the importance of stochastic versus deterministic processes for the modification in species assemblages following disturbances. Here, we use this approach to investigate the processes underlying species loss in the assemblage of forest specialist small mammals across (1) six Atlantic forest landscapes differing in the amount of remaining habitat (three continuously-forested landscapes, and three adjacent fragmented landscapes with 50%, 30%, and 10% forest cover); (2) fragments of different sizes. In the study areas, total amount of habitat was previously shown to determine richness of forest specialist species, with a drastic decrease associated with an exponential increase of inter-patch distances below a threshold around ~20% of remaining habitat. Further, patch area effects on richness have been shown to be context-dependent and only present at intermediate levels of total habitat amount (30%), immediately before the exponential increase in landscape-wide species extinction. In the present study species loss across fragments of different sizes within the 30% forest cover landscape could not be distinguished from a random process. However, species loss across landscapes with decreasing forest cover proved to be deterministic, with species composition in fragmented landscapes representing a non-random sample of species in continuously forested areas. Results suggest that the consideration of deterministic processes associated with differences among habitat specialist species (other than habitat requirements) are crucial for modeling and mitigating habitat loss effects.

FS10.P.02

Third dimension metric improves prediction of species occurrence in a fragmented landscape.

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Terrestrial landscape usually have a complex relief, but studies conducted to determine the response of animals to landscape, patch, and within-patch variables have usually neglected the third dimension . Here, we investigate the capacity for topographic variables to improve the accuracy of species presence models. We determined the presence/absence of a Neotropical primate, *Callicebus nigrifrons*, across 48 Atlantic Forest remnants, in southeastern Brazil. We mapped roads and land cover through digital processing images (CBERS-2B). Next, we calculated plan (isolation index, patch size, shape and road distance) and topographic (total area of the fragments which were visible from the primate's perspective at the focal fragments) metrics using ArcGIS 9.2TM. Based on biological and ecological information, we formulated a set of a priori hypotheses to explain primate occurrence from these metrics. We built the models using Generalized Linear Model for Logistic Regression, and we selected the best-plausible model and evaluated the predictor data with the Akaike Information Criterion. The topographic metric was an important variable for explaining *Callicebus nigrifrons* presence. The three plausible models incorporated this variable and the models without this metric were implausible ones. However, this metric alone also generated an implausible model. Therefore, *Callicebus* presence models need to combine both topographic and plan metrics for creating the fittest models. When animals make a decision for colonization, dispersion, predator escape or foraging, they weight several fragment and landscape variables. Relief can influence decision making by blocking viable patches from view or hindering estimation of its features, thus decreasing landscape functional connectivity. Studies on 2D may have overestimated connectivity because they haven't considered the topographic perspective. Thus, we believe future studies should be conducted incorporating the third dimension, since we understand it may strongly influence animal biology and it may impact on conservation policy, landscape planning and conservation biology.Financial support: FAPEMIG

FS10.P.03

Conservation Value of Different Land Use Systems for the Community of Scarabaeinae Beetles (Coleoptera: Scarabaeidae) in Fragmented Landscapes of the South of Minas Gerais – Brazil

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The modification of tropical ecosystems by the expansion of agricultural activities has caused drastic changes in the landscape, transforming continuous areas of forest in a mosaic of remnants and anthropogenic habitats. In this paper we analyze the role of forest corridors, pastures and coffee plantations for the conservation of dung beetles diversity in 12 landscapes in the southern state of Minas Gerais, Brazil. In each landscape were sampled four sites: forest fragment, forest corridor, coffee plantation and pasture. In each site a linear transect was installed with six pitfall traps, baited with human feces, 30 m apart from each other. We collected 2695 individuals of dung beetles belonging to 52 species, 19 genera and six tribes. The pasture had higher species richness than the other sites and the fragment showed a higher biomass and abundance. Regarding the species composition, four groups were obtained and the multivariate dispersion of points was higher in the pasture and corridor. The percentage of canopy cover was the most important variable influencing richness and total abundance of Scarabaeinae. The corridor had the highest conservation value, followed by coffee plantation and pasture. The removal of occasional species increased the proportion of unique species in the fragment and decreased the proportion of shared species found in the modified systems. Despite the removal of occasional species decrease the conservation value of the corridor, this element is still important for the dispersal of species in the landscape and its potential value as habitat for some dung beetles species was verified in this study.

FS10.P.04

Scolytidae (Coleoptera) in forest fragment of semideciduous tropical forest and reforestation of riparian vegetation in southern of Brazil

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Scolytidae beetles are important as biological agents, because participate in nutrient cycling and aid in the decomposition of dead plants, contributing to the maintenance of forest dynamics. This study compared abundance and diversity of Scolytidae in forest fragment of semideciduous tropical forest and reforestation of riparian vegetation, and verified if the reforestation has conditions to host these beetles. The individuals were collected with baited pitfalls from May 2007 to April 2008 in adjacent reforestation and forest fragment, in Alvorada do Sul (Paraná, Brazil). 1133 individuals of Scolytidae of 10 different species were collected, which 85,8% were from forest fragment and 14,2% from reforestation. *Coccotrypes* sp.1 was the most abundant specie in both areas. There were more individuals in the fragment in January and February, while for the reforestation in March. These results are correlated with values obtained for *Coccotrypes* sp.1 for these months, coinciding with the hot and rainy season. However, no significant correlation between the number of individuals with temperature and rainfall was found. Shannon-Wiener index is similar for both areas ($H'_{fragment}$=0,68; $H'_{reforestation}$=0,87; t=-1,91; p=0,06). The equitability between two areas indicates that the distribution of the species not is regular ($E_{fragment}$=0,33; $E_{reforestation}$=0,43), probably because of the high number of *Coccotrypes* sp.1. This high number of *Coccotrypes* sp.1 also reflects in the dominance of the species ($D_{fragment}$=0,63; $D_{reforestation}$=0,57). However, the Sorensen similarity between two areas is high (75%), possibly because there is an interaction between forest fragment and reforestation. The resemblance between forest fragment and reforestation in relation to diversity and high similarity may indicates that the reforestation provides environmental conditions to host some species of Scolytidae, and that forest fragment may be acting as a source of these beetles for the adjacent reforestation. (Acknowledgments: Universidade Estadual de Londrina, Fundação Araucária, CNPq).

FS10.P.05

Comparison of tree assemblage in forest fragments surrounded by different types of matrices.

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Anthropogenic areas surrounding forest fragments are known as thematrix and each type may present particular structural and environmental characteristics that could differentially influence the species permeability. The aim of this study was to verify whether there are differences in: (a) richness and diversity of species, and (b) structural parameters (height, diameter, height of first branch) of trees among fragments surrounded by different types of matrix. The study was carried out in six fragments in Minas Gerais-Brazil surrounded by different types of matrix (coffee, sugarcane and pasture). The height, diameter, height of first branch of individuals and richness of species was compared among the three different matrix types by one-way ANOVA. The Simpson and Shannon-Wiener diversity indices were calculated and compared among fragments by Diversity t test. We recorded 1405 individuals of 152 species in the studied fragments. The diversity of species in fragments surrounded by a coffee matrix was greater than in fragments surrounded by a sugarcane matrix (t=12.84; p=0.004), but there was no difference between the other matrix types. However, fragments surrounded by a sugarcane matrix had individuals with greater height ($F_{2;2802}$=109.9; p=0.0001) and diameter ($F_{2;2802}$=5.8; p=0.0035), while fragments surrounded by a coffee matrix had smaller individuals. There was no statistical difference for richness of species ($F_{2;2802}$=0.53; p=0.63) and height of first branch ($F_{2;2802}$=1.11; p=0.33). According to the results we can say that the tree assemblages are affected by matrix type and the structural parameters are more sensitive to the effects generated by the anthropogenic area. Our results also suggest that fragments surrounded by a coffee matrix are less prejudiced, possibly due to microclimatic and structural similarity between these matrices and the fragments.

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FS10.P.06

Influence of different matrix types in reproductive functional groups of tree assemblage in forest fragments

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The term "matrix" refers to the anthropogenic area around natural fragments that can influence the “structural connectivity” of habitat patches and may be an important part of an organism’s environment. The aim of this study was to verify whether the matrix type surrounding a forest fragment can affect the richness and functional diversity of certain reproductive functional groups including: (a) pollination systems, (b) dispersion syndromes, (c) reproductive system, and (d) sexual system. The study was carried out in six fragments in Minas Gerais-Brazil surrounded by different types of matrix (coffee, sugarcane and pasture). The species classification into each reproductive functional group was based on literature data and field observations. The richness categories of reproductive functional groups were compared by one-way ANOVA and the Shannon’s and Simpson’s indices were used to calculate the functional diversity of reproductive traits in each fragment. Most of the plant species are hermaphroditic (31.7%), self compatible (22.0%), zoochoric (75.6%) and pollinated by bees (melittophily) (48.8%). The fragments surrounded by a coffee matrix showed greater richness ($F_{2;4}$=17.33, P=0.02) and diversity of pollination systems (t=7.07; p=0.01 and t=18.33; p=0.0001), and diversity of dispersion syndromes (t=26.87; p=0.0001 and t=25.95; p=0.0001) than the fragments surrounded by sugarcane and pasture. However there were no differences in richness of dispersion syndromes ($F_{2;4}$= 0.09, p= 0.76), reproductive systems ($F_{2;4}$= 0.51, p= 0.50), and sexual systems ($F_{2;4}$= 0.34, p= 0.96) and diversity of reproductive system, and sexual system among fragments. According to the results we can say that matrix type affects reproductive functional groups, especially those groups which include plant-animal relationships (pollination and dispersion), possibly because these relationships are very sensitive to environmental changes. Our results also suggest that fragments surrounded by coffee matrix are less affects, because of their microclimatic and structural similarity with the forest fragments.

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FS10.P.07

Identifying conservation-priority in fragmented landscape based on multiple umbrella species concept

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Multiple umbrella species concept is useful as one scientific basis of conservation strategies that identify potential lands to protect biodiversity. These species have high ecological demand and their conservation would protect others less sensible. This study combines ecological niche modeling and regression models for nine multiple umbrella species, aiming: (i) to evaluate the performance of the current conservation-priority defined by BIODIVERSITAS (ONG), with respect to the representation of umbrella species, (ii) to identify potential areas for expanding the conservation-priority. Nine bird species were selected according to their difference on ecological function, geographic distribution and forest dependence. In a two-step protocol, we used the maximum entropy algorithm (MAXENT) to predict the distribution of species. Then, we combined it with landscape and patch metrics to build regression models of species abundance. We evaluated the abundance of birds by point count sampling in 26 landscapes in South of Minas Gerais State, Brazil, between 2010 and 2011. We used Akaike Information Criteria to compare the models and verify the relative importance of each variable. We then combined the best selected models, using Geographical Information System (GIS), to identify priority landscapes (hexagon = 1200 ha). Multiple umbrella species differed markedly in the patch or landscape requirements, but when the models were combined, they showed some similarities with the potential area defined by BIODIVERSITAS. However, the better resolution of our approach enabled to identify errors and omissions in the identification of potential conservation areas. Further, we demonstrated the potential values of multiple umbrella species to conservation decision-making.
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FS10.P.08

Influence of adjoining eucalypt plantations on nocturnal orthoptera communities from mangrove forests in Caravelas, Bahia, Brazil

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Situated in the transition zone between terrestrial, marine and limnic ecosystems, mangrove richness and diversity may be influenced by human impacts to all three ecosystems. The objective of this study is to verify if eucalyptus plantations adjoining a mangrove forest influence the mangrove's nocturnal orthoptera community, i.e. grasshoppers and crickets. We compared the diversity and richness of nocturnal orthopteras from two study sites in Caravelas, Bahia, Brazil. The first mangrove forest is buffered by natural vegetation (NV), while the second one is adjacent to a eucalyptus plantation (EP). In both areas, insects were collected over six nights using light traps equipped with black light. All captured individuals larger than 1 cm were classified into morphospecies. The biodiversity indices of Shannon-Wiener and Fisher's α were calculated using the EstimateS software. In total, 139 grasshoppers and crickets from 12 morphospecies were registered. Only 19 individuals from eight morphospecies were found in EP, but 120 orthopteras belonging to nine species were collected in NV. Due to the high dominance of one morphospecies from the Tetrigidae family, the diversity of orthopteras in NV is less than in EP: The Shannon-Wiener index is 1.59 in EP and 0.76 in NV, Fisher's α is 5.21 (± 1.94) in EP and only 2.25 (± 0.41) in NV. As richness and abundance are greater in NV, but the diversity is greater in EP, the interpretation of results is unambiguous: The lower richness and lower abundance of EP nocturnal orthopteras indicate negative influences, perhaps resulting from pesticide use in nearby eucalyptus plantations. But that did not affect diversity. Further studies are necessary to draw more consistent conclusions about the influence of eucalyptus plantations on the nocturnal orthoptera of mangrove forests and their suitability as indicators for the intactness of mangrove forests.

FS10.P.09

Impacts of pasture matrix on forest fragments using ant species richness as bioindicator

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Pasture is one of the simplest agricultural matrices with generally very low species diversity. These matrices have increased temperatures and only a few species are able to live in these adverse conditions. Ants are a key group to evaluate differential impacts that the agricultural matrix has on biodiversity. Here we aimed to evaluate the effect of the pasture matrix on forest fragments using ant species richness as bioindicator. We used a set of environmental variables to examine what happens in each matrix and forest fragment. We used pitfall traps (48h/field) to sample ant species in three pastures and three of the nearest forest fragments and linear regression with log link to analyze our data with a poisson distribution (R program). We found a total of 75 ant species in all matrices and forest fragments. Ant species richness was not different between pastures and forest fragments (r^2= 2.81^{e+00}; p=0.42). Additionally, only the plant density within pastures explained the ant species richness (r^2=$-6.6e^{-02}$; p=0.041). Species composition was quite even and only two species occurred just in forest fragments. Most ants were generalist species and frequently sampled in all areas. Our results highlight that degraded fragments with low environmental quality, such as those surrounded by pasture, require management to improve them. With management these matrices may become more permeable to forest species which may help minimize impacts on biodiversity in nearby forest fragments.

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FS10.P.10

Agricultural land-use matrix effects on amphibian biometry, abundance and species richness in Atlantic forest fragments

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Habitat fragmentation is one of the greatest causes of habitat loss and species extinction, particularly for forest environments. Besides habitat loss, landscapes are altered due to the replacement of natural forests with crop and livestock farming. Given their ecological characteristics amphibians are often considered to be particularly sensitive to these changes, making them potential bioindicators for population declines and biodiversity loss. The aim of this study was to determine whether different land-use matrix types can affect the biometry and relative abundance of the most common amphibian, *Haddadus binotatus* (Anura: Craugastoridae), and whether they can also affect overall amphibian species richness within the different fragments. To this end, and based on padronization of size, presence of water bodies and surrounding matrix, nine seasonal and semideciduous Atlantic forest fragments were selected in southern Minas Gerais. Three of these fragments are surrounded by coffee plantations, three by sugar cane and three by pastures. Each fragment was surveyed for six hours through Visual Encounter Surveys and advertisement call playback on a 300 m linear transect parallel to a water course. Rarefaction curves were used to assess species richness in the different fragments whereas Kruskall-Wallis tests were used to compare the relative abundance of *H. binotatus* in fragments embedded in the three different matrix types. Snout-Vent Length (SVL), biomass and biomass/SVL ratios were compared using ANOVA-Tukey, post-normality tests. Eleven amphibian species were recorded, and there were no significant differences across fragments in either total species richness or relative abundance of *H. binotatus*. Biometric analyses revealed differences only in the biomass/SVL ratios between coffee and sugar cane matrices ($F_{df=2}$=3.517, p=0.046, $p_{coffeeXsugarcane}$<0.05). Financial support: FAPEMIG, CNPq, Fazenda Monte Alegre Coffees.

FS10.P.11

Urban population and Gross Domestic Product can`t explain the habitat fragmentation to small mammals at Brazilians Pampas, but rural population can

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In this study we aimed to analyze if the socioeconomic variables, urban and rural population and Gross Domestic Product (GDP) can explain the habitat fragmentation to small mammals at Brazilians Pampas. To solve this question we analyzed a vegetation map built upon satellite photos, the urban and rural human population and the GDP of the Pampas region. All these data were obtained at the 2000 decade and were spatially analyzed in a hexagonal grid of 71 cells, each one with 2.500 km^2. To analyze the fragmentation in a small mammal point of view, we used 500 m as the functional connectivity among fragments, once a large number of small mammals can move this distance among remaining vegetation. We used as an indicative of habitat fragmentation at each cell: (i) the total area of remaining vegetation, (ii) the number of components and (iii) the area of the great component. The socioeconomic variables were used to explain the fragmentation under stepwise multiple regression models. All the models were statistically significant, but only rural population were included in these models. These results must be analyzed having in mind that the Pampas biome is essentially agricultural. Only less than 3% of its area is occupied with urban regions, once its population has a small capability to influence the fragmentation of the entire biome. The non significant relation between fragmentation and GDP indicates that the economic growth in Pampas don’t influence directly the fragmentation, but to better understand this relation it’s indicate to separate rural and urban GDP.

FS10.P.12

Small mammal responses to fragmented landscapes: a case study in the Brazilian Atlantic Forest

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Knowing that there is close relation between species richness, composition and diversity and landscape structure, this study aimed to understand the effects of habitat fragmentation on small mammal communities. During 24 months, I studied six forest fragments and three areas inside a State Park, in southern Brazil, using capture-recapture method. Marsupials were 98% of all captures, and *Didelphis albiventris* and *Marmosa* (*Micoureus*) *paraguayana* the most frequent. *D. albiventris* occurred in all fragments, being dominant in all communities, except in the park. *M. paraguayana* was absent only in the smaller remnant. Some species were found only in the park, which is the most rich and diverse area. The smaller fragment has the lowest values for both indices. A nested subsets analysis showed high nestedness in the small mammal assemblages, caused by differential extinction of species. Landscape indices, simulated dispersal ability of species and multiple regression were used to investigate the relationship between landscape structure and community indices. I found strong species-area relationship, but proximity to other patches of the same type in a short distance is the factor that best explains variations on richness and diversity of small mammals on this system. The measure of isolation refers to movement between fragments and, due to their low dispersal ability, small arboreous marsupials seem to be isolated. Our landscape is composed by small fragments separated by large open fields, easily crossed by large mammals, but effective barriers for small ones. I recommend restoration of fragment edges to increase effective areas and the decrease of the distance between patches with improvement of matrix permeability, using, for example, stepping-stones with trees in pastures, separated by short distances, to allow movements of individuals. Landscape management in a finer scale could effectively mitigate isolation effects for a wide array of species.

FS10.P.13

Do beetles compensate the low seed predation by rodents in forest fragments? A test with an Atlantic forest palm in Brazil

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Habitat fragmentation and hunting do not affect forest species in the same way. Large mammals and birds, many of them important seed predators and dispersers, are especially prone to be locally extinct. As a consequence, plants that produce large seeds such as palms have a lower seed removal rate and large piles of seeds are often found under palm trees within fragments. It has been proposed that boring beetles (Curculionidae) may compensate the scarcity of mammals in fragments, killing the remaining seeds that otherwise would be removed away or be lost to large rodents. We tested this hypothesis for *Syagrus rommanzoffiana*, a palm largely distributed in the Brazilian Atlantic forest. Samples of fallen seeds were collected under adult palms in three small forest fragments ranging in size from 0.1 to 2 ha. The seeds were classified as rotten, viable, preyed on by rodents or by beetles. The same data were obtained for other five larger fragments (up to 35,000 ha) from the literature. As predicted, beetle seed predation (mainly *Revena rubiginosa*, Curculionidae) predominates in small fragments, killing around 60% of seeds (ANOVA: $F_{3,16} = 20.4$; $p < 0.001$). Considering all fragments as replicates (n = 8), beetles and rodents switched roles as seed predators of *S. rommanzoffiana* ($r^2 = - 0.52$; $F_{1,6} = 6.4$, $p = 0.045$), with rodents being more important seed predators at larger fragments. However, the slope (-0.28 ± 0.11 (± SE)) indicates that beetles only partially compensated when seed predation by rodents felt to low levels. Thus, more seeds were available for recruitment around adult palms in small fragments. The spatial distribution and abundance of seedlings and juveniles around adult palms suggest that predator satiation may be occurring in fragments, with a possible effect on local plant diversity in the long way.

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FS10.P.14

How does forest fragment size affect anuran metapopulations?

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The Atlantic rainforest biome is currently reduced to forest fragments, which makes biodiversity conservation for the biome challenging. Some studies demonstrate that the number of species and their relative abundance increases with fragment size. Amphibians are potentially good bioindicators of this phenomenon, but their close relationship with water may compensate for the need for extensive habitats. The aim of this study was to determine the effect of forest fragment size on overall species richness and on the abundance and biometry of the two most common anuran species, *Haddadus binotatus* (Anura: Craugastoridae), a direct-developer, and *Aplastodiscus leucopygius* (Anura: Hylidae), a larval developer, in 15 fragments of seasonal semideciduous Atlantic rainforest in southern Minas Gerais. Forest fragments were classified as small, medium or large, and all fragments had some sort of water body within them. Each fragment was surveyed for six hours through Visual Encounter Surveys and advertisement call playback on a 300 m linear transect parallel to a watercourse. In total 21 anuran species were recorded, and species richness between the three fragment size categories was compared using rarefaction curves. Relative abundance and biometry (Snout-Vent Length (SVL), biomass and biomass/SVL ratios) for *Haddadus binotatus* and *Aplastodiscus leucopygius* were compared using Kruskal-Wallis/Dunn tests. There were no significant differences in total species richness in relation to fragment size, nor with regards to relative abundance for either *H. binotatus* (Hgl=2=1, p=0.537) or *A. leucopygius* (Hgl=2=0.260, p=0.878). Biometric analyses indicated differences only in the SVL of *A. leucopygius* ($F_{gl=2}$=12.625, $p_{smallXlarge}$<0.05). These results suggest that fragment size does not influence species richness or abundance, but that it may affect important biometric parameters. Financial support: FAPEMIG, CNPq, Fazenda Monte Alegre Coffees.

FS10.P.15

Are Seasonal Deciduous Forest more resistant to habitat loss and fragmentation?

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The transformation of continuous forests in many forest fragments is a generalized process in the tropics. A kind of mosaic agro-forest highly fragmented by man is already the predominant landscape in many regions previously forested. Ecological research in anthropogenic environments to assess the effects of habitat loss and fragmentation are necessary to support management actions and effective public policies. The objectives of this study were to compare the richness, species composition and dispersal strategies of trees from a continuos forest area and a set of nearby forest fragments. The study was conducted in Turvo State Park and in nearby areas, in the northwest of Rio Grande do Sul. The Park has an area of 17.491 ha and the vegetation is classified as Seasonal Deciduous Forest. We established 10 plots of 10 m x 100 m (0.1 ha) within the continuous forest and 10 plots distributed in 10 different fragments in the vicinity of the Park. All trees with diameter at breast height ≥ 10 cm were identified. We recorded significant differences between the composition of the flora of the fragments and continuous forest areas (MANOVA, F=2.364, p=0.0018). We found a greater number of individuals of pioneer species in fragments (37% versus 28% in continuous forest). The richness did not differ significantly between samples (t test; t=-0,111, p=0,913), nor were differences observed between the dispersion strategies or the numbers of individuals from different strata of the forest. It is recognized that seasonal forests are more adapted to seasonal drought and high rates of solar radiation by the leaves fall at certain times of year. Thus it is likely that the impacts of fragmentation related mostly to edge effects seem to have less impact on the tree synusiae in seasonal forests when compared to rain forests.

FS11.P.03

Sustainable agriculture: High Conservation Value or high confusion value?

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Green labeling of products that have been produced sustainably is an emerging tool of the environmental movement. A prominent example is the Forest Stewardship Council, which certifies timber that is harvested to manage and maintain forests defined as having High Conservation Value (HCV). The criteria for HCV are now being applied to four rapidly expanding crops in the tropics: oil palm, soy, sugarcane, and cacao. Do these criteria provide adequate protection for biodiversity when applied to agriculture? The only criterion that provides blanket protection to forests is one that protects large expanses of habitat. Absent of other HCVs, the collective clearing of forest patches below these thresholds could result in extensive deforestation that would be sanctioned with a green label. Yet such forest patches retain much biodiversity and provide connectivity within the agricultural matrix. An examination of forest fragments in Brasil, Nigeria, Malaysia and Indonesia shows that future agricultural demand can be met by clearing only forest patches below a 1,000 ha threshold. We recommend the development of a new HCV criterion that recognizes the conservation value of habitat patches within the agricultural matrix and that protects patches above 1,000 ha. We then introduce other critical issues for certification schemes that conservation scientists need to urgently consider. Failure to focus on these issues is liable to result in sustainability labels that do not protect sufficient biodiversity and carbon, with potentially dour consequences for long-term conservation in the tropics.

FS11.P.04

The silence degradation in the water paradise: Sedimentation in caves of Serra da Bodoquena karst area, State of Mato Grosso do Sul, NW Brazil

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Karst areas are characterized by efficient flow of groundwater through conduit systems originated by the properties of soluble rocks. Therefore, the water usually drains rapidly into the subsurface at recharge zones, through a network of fractures and cave conduits. This groundwater emerges at the surface in discharge zones through springs and wells. The Bodoquena Plateau, which includes Bonito County, is an important Brazilian karst area, with a remarkable subterranean fauna still incompletely known. Deforestation is a global environmental threat, even more in the fragile karst landscapes, due to the predominance of groundwater drainages. Intensification of sedimentation, caused by human actions, mainly deforestation and livestock, were recorded in three caves of high hydrological and/or biological relevance. The record was done through field visits to caves and their surroundings, the analysis of regional geomorphological maps, photographic documentation and interviews with local people. In Fadas Cave, where the subterranean community has been monitored since 2006, a large deposit of sediment (1.5 m height) was formed after the deforestation of one important sinkhole area located about 300 m far from base level subterranean stream. In Califórnia and Beija-Flor caves, the formation of erosional craters was identified at many upstream points. These caves are major sinkholes and their streams are in advanced stages of sedimentation, including inside the cavities. In those caves, the livestock activities on an important recharge zone of the karst aquifer carry a large volume of sand sediment into the caves and is causing the siltation of underground streams. The presence of exclusively subterranean (troglobitic) species of both vertebrates and invertebrates and the significant volume of groundwater drainages make these cave systems high relevant for conservation and seriously endangered by the inappropriate use of the karst landscape.

FS11.P.06

Conservation genetics of tropical species

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The completion of the human genome sequencing in 2003 opened a new perspective into the importance of whole genome sequencing projects, and currently multiple species are having their genomes completed sequenced, from simple organisms, such as bacteria, to more complex taxa, such as mammals. This voluminous sequencing data generated across multiple organisms provides also the framework to better understand the genetic makeup of such species and related ones, allowing the assessment of its evolutionary histories and patterns of genetic diversity that can be highly valuable for conservation. The utility of genetics in the in-situ and ex-situ conservation of tropical biodiversity will be discussed, with emphasis on case studies comprehending several charismatic endangered vertebrate species, from wild exotic big cats to giant snakehead fishes.

Associated publications to this abstract include:

1. **Antunes A**, Troyer JL, Roelke ME, Pecon-Slaterry J, Packer C, Winterbach C, Winterbach H, Hemson G, Frank L, Stander P, Siefert L, Driciru M, Funston PJ, Alexander K, Prager KC, Mills G, Wildt D, Bush M, O'Brien SJ, Johnson WE. 2008. The Evolutionary Dynamics of Lion *Panthera leo* Revealed by Host and Viral Population Genomics. PLoS Genetics 4(11): e1000251.

2. Luo SJ, Johnson WE, Martenson J, **Antunes A**, Martelli P, Uphyrkina O, Traylor-Holzer K, Smith JLD, O'Brien SJ. 2008. Subspecies genetic assignments of worldwide captive tigers increase conservation value of captive populations. Current Biology 18: 592–596.

3. Benziger A, Philip S, Raghavan R, Ali AP, Sukumaran M, Tharian JC, Dahanukar N, Baby F, Peter R, Devi RK, Radhakrishnan K V, Haniffa M A, Britz R, **Antunes A** (2011) Unraveling a 146 Years Old Taxonomic Puzzle: Validation of Malabar Snakehead, Species-Status and its Relevance for Channid Systematics and Evolution. PLoS One 6 (6):e21272.

FS11.P.07

EFFECTS OF SEAWEED FARMING ON THE SEAGRASS COMMUNITY OF PANJANG ISLAND, BANTEN, INDONESIA

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Seaweed farming is an important source of livelihood for coastal communities in the tropics. However, as the intensity of seaweed farming continues to increase on a global scale, its effects on the surrounding environment becomes an issue of concern. Seaweed farming can potentially produce physical disturbance due to trampling by humans and the introduction of seaweed which reduces light penetration into the water column. This disturbance may consequently threaten natural ecosystems, particularly seagrass meadows. This study was conducted to describe the effects of various seaweed farming techniques and planting densities on the seagrass community of Panjang island in Banten, Indonesia. Cover, biomass, and leaf production of the dominant seagrass species, *Enhalus acoroides* were measured in 1 m^2 plots placed in the field. Experimental plots consisted of six treatments of *Eucheuma spinosum* seaweed farming, varied according to three farming techniques (long line, off-bottom, and broadcast methods) and two levels of planting density (50% and 100%). Plots without seaweed were used as control. *Enhalus acoroides* cover was measured after 36 days, then harvested to measure biomass and leaf production. Mean biomass from all treatments ranged from 4.4 to 8.9 g dw ind^{-1} while mean control biomass measured 6.5 g dw $indiv^{-1}$. Mean shoot productivity in treated plots ranged from 0.00572 to 0.00845 g dw $shoot^{-1}$ day^{-1} while control measured 0.00478 g dw $shoot^{-1}$ day^{-1}. Data for cover, biomass and productivity did not exhibit any particular pattern or trend, and there were no significant differences among treatments for all variables measured. Results of this study suggest that seaweed farming does not affect the seagrass community. However, further studies to understand long term effects in the relationship between seaweed farming and the ecological conditions of seagrass beds are still needed for the sustainability of both seagrass ecosystems and farmer livelihood.

FS11.P.08

New forests in Latin America and Caribbean: where and why.

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In Latin America and Caribbean (LAC), deforestation, particularly the conversion to pastures and agriculture, has been the dominant land change process for hundreds of years. In contrast, during the last 20 years, local studies throughout LAC have reported forest recovery. Unfortunately, since no previous analysis has simultaneously evaluated deforestation and reforestation at the continental scale, we lack a comprehensive assessment of the spatial distribution of these processes. To overcome this limitation we produced annual maps of land use/land cover (LULC) between 2001 and 2010 for each of the 16,050 municipalities in LAC. Deforestation continues to be the dominant process in LAC. We estimated that between 2001 and 2010 approximately -541,835 km^2 of woody vegetation was converted to another LULC class. But, during the same period, 362,430 km^2 recovered woody vegetation. Although the level of reforestation varied greatly among countries, every country had at least one municipality with a significant increase in woody vegetation. In the Caribbean, Cuba was the country with the most reforestation due to the loss of sugar subsides from the Soviet Union during the 1990s, which resulted in the abandonment of >1 million hectares of sugar cane and the invasion of woody vegetation. In northern Mexico, the large increase in woody vegetation appears to be the result of drug violence, abandoned agriculture, and an increase in rainfall. Similarly, in Colombia violence in rural areas has resulted in rural-urban migration and the appearance of new forests, particularly in mountainous regions. Another region with extensive areas of new forests was the Caatinga ecoregion in northeastern Brazil. This change coincided with an increase in precipitation, improving access to off-farm employment, and a decrease in agricultural activities. These new forests need to be incorporated into: 1) ecological research agendas, 2) conservation activities, and 3) the calculations for REDD baselines.

FS11.P.09

HELPING THE ENEMY: NATIVE NURSE TREES FACILITATE ALIENS TO INVADE BRAZILIAN SEMI-ARID SHRUBLANDS

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Positive interactions between native plant species are known to be fundamental forces determining the structure and composition of stressful habitat communities. In arid and semi-arid ecosystems, the micro-climatic conditions provided by native tree species (nurse species) can be a key factor promoting the establishment of tree seedlings. Recently, some studies assessed the importance of these interactions for plant invasion. This work tests if alien tree species are profiting the facilitative effects of native tree species to invade the semi-arid Caatinga biome. In the Seridó Ecological Station (Brazil), we performed a factorial block-designed experiment with two important alien species (*Leucaena leucocephala* and *Prosopis pallida*) and five widespread native species (*Aspidosperma pyrifolium*, *Combretum leprosum*, *Croton sonderianus*, *Poinceianella pyramidalis* and *Mimosa tenuiflora*). Seeds of the exotic species were sown in the presence and absence of potential nurse species, to compare germination success and seedling survival. We found clear evidence that native trees facilitate alien species to invade the semi-arid region. The presence of nurses enhanced both the number of seeds germinated and the survival of seedlings of alien species. The intensity of the facilitation effect was more intense for *Leucena leucocephala* than for *Prosopis pallida*. Our results indicate that intensity of facilitation in germination phase varied depending on specific nurse, although for seedling survival nurse plants showed similar effects. No species-specific interaction between nurses and targets were found. Our results suggest that microclimatic modifications associated with nurse plants could be important for the germination success and seedling survival of alien species. This work highlights the importance of facilitation by native species as a driver of invasion in stressful habitats.

FS11.P.10

Species Richness and Endemism of Cave Bats and Herpetofauna in Siargao Island Protected Seascape and Landscape, Philippines

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Siargao Island is a protected area in Mindanao, Philippines known for its hundreds of caves. Caves are considered as arks of biodiversity yet the cave fauna of Siargao Island is poorly known. In this study a modified cruising method was used to determine species richness, endemism, and conservation status of herpetofauna and mammals in ten caves in Siargao Island. Sixteen species of herps and mammals with 44% endemism were recorded. A higher endemism of 63% was recorded for herpetofauna while bats had low endemism of 25%. A relatively higher species richness was observed in two caves in Siargao. No threatened species was documented. Treasure hunting and guano collection appear to be the main threats to the cave biodiversity which should be given attention. The high endemism indicates the need to conserve these caves and the biodiversity within. Considering the large number of caves in Siargao Island, surveys of more caves in other parts of the island could yield more species of bats and herpetofauna.

FS11.P.11

Fractal models of animal foraging in tropical forests

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Fractal distribution of prey is discussed in the context of mathematical models exploring forager-prey interactions when they occur in heterogeneous landscapes characterizing tropical forests. It is shown that forager movement statistics may be scale-free distributed when searching is done following deterministic rules (optimization of the gain/energy balance) but this also depends strongly on the resource availability. When using non-uniform realistic tree-size and tree spatial distributions, forager movements are an emergent property of the forest-animal interaction. The Deterministic-walk formalism is very useful for disentangling the current debate on how forager-prey interactions built-up patterns of animal movement. We discuss potential applications for the study of frugivore mammals, birds and selective logging by humans.

FS11.P.12

Genetic diversity and forest cover analysis of twenty natural populations of *Euterpe edulis* Mart. in the state of Santa Catarina, Brazil

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Euterpe edulis Mart. presents a high economic value and potential use (palm-heart and fruits), and is currently found on the Brazilian endangered species list. Fragmentation is recognized as an important factor, which threatens the survival of long-term populations. Thus, the objective of this study was to evaluate forest cover and the effect of fragmentation on the genetic diversity of *E. edulis*, in order to generate information for its conservation. In this study 20 populations were sampled, and within each population 50 individuals were genotyped using isozyme electrophoresis. The surrounding forest cover was analyzed with a 4km radius buffer using the program ArcGis 9.2, and the forest remnants map Nature 2005. A PCA analysis (R 2.11.1) was used to test the association between the genetic diversity indexes and forest cover data, which include the variables, percent of forest cover, number of fragments, fragment size, and mean fragment size. The total number of alleles found for all populations was 42 (A = 2.18 ± 0.11). On average the populations demonstrated a moderate and high genetic diversity ($P_{99\%}$ = 0.62 ± 0.06; H_o = 0.205 ± 0.036; H_e = 0.236 ± 0.026), and a fixation index of 0.130 (± 0.107). In the PCA analysis the variables percent of forest cover, number of fragments, fragment size, observed heterozygosity and fixation index showed the greatest associations. Thus, the populations of São João Batista, Tijucas, Praia Grande e Joinville, present high forest cover and fragment size, low fixation indexes, and high genetic diversity values. These results indicate important populations for genetic diversity conservation, considering their high genetic diversity, large fragment size, and forest cover above 69%. The results suggest that for this species the maintenance of genetic diversity is directly related to the percent of forest cover.

FS11.P.13

IMPACT OF THE REGIONAL NETWORK OF CONSERVATION EDUCATORS IN ALBERTINE RIFT ON SUSTAINABILITY OF BIODIVERSITY CONSERVATION IN THE REGION

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The Albertine Rift (AR) stretches from the northern end of Lake Tanganyika through the countries of Uganda, Rwanda, Democratic Republic of Congo, Burundi and Tanzania and is known as a biodiversity hotspot. Results drawn from questionnaires used for the survey conducted throughout RNCEAR in these four countries, released that the Network of Conservation Educators in the Albertine Rift (RNCEAR) has had a positive impact on the region, which has limited capacity in conservation science. Through a network of universities and research institutions dedicated to building capacity among researchers, instructors and practitioners in the Albertine Rift (AR), individuals from the region can contribution more effectively to biodiversity conservation and climate change adaptation through collaborative approaches. The Network supports collaborations by sharing regional resources and expertise, developing teaching and research skills and access to annual meetings and workshops. With the goal of empowering individuals in the Albertine Rift to participate in biodiversity conservation, the Network encourages collaboration, capacity building, and raises awareness about the role of regional universities and research institutions to participate in biodiversity conservation and climate change adaptation in the region. As the region and the world are facing global climate change which is highly affecting biological diversity and destabilizing ecological services, the need for collaboration and strong linkages among well trained individuals from the AR is urgent so as to sustain our biodiversity and environmental protection.

FS11.P.14

Valuing Botanic Gardens: a Case Study in Brazil

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Considering that the botanic gardens use is a well-established global practice of plant species maintenance, endangered plant species preservation and recreational activities promotion, the gardens' maintenance and dissemination is a legitimate concern for biodiversity conservation strategies. Nevertheless, botanic gardens in the tropics are still in need of better technical, scientific, and financial support. In this way, the environmental economic valuation of botanic gardens can provide parameters for the design and the implementation of public policies that aim to conserve these areas, since the valuation tools translate into monetary values the various ecosystem services provided by them. This study reports results obtained by using the travel cost method for the Botanic Garden of Belo Horizonte's Zoo-Botanic Foundation, Minas Gerais, Brazil (BG/BH-ZBF), to estimate the annual value of its ecosystem services. Individual interviews were conducted between July and August 2011. Through questionnaires, we collected information about the socioeconomic costs incurred by the visitors, for example, to be at the botanic garden, which allowed the estimation of the demand curve for BG/BH-ZBF recreational services. The estimative for the BG/BH-ZBF annual recreational use was from R$109,021,816.60 to R$115,481,256.00, depending on t he functional form of the model used to estimate the BG/BH-ZBF recreational demand curve (linear or semi-log). We are not aware of other research that has analyzed the ecosystem services value provided by a botanic garden in the Brazilian context. Indeed, very few studies have assessed the socio-economic benefits provided by these areas anywhere in the world. This exercise shows the usefulness of the environmental valuation as a tool for the management of natural resources such as botanic gardens and similar. Even considering the increase of the opportunity cost of urban space in Brazilian cities, the general public appreciates and values areas where one can enjoy the amenities offered by nature.

FS11.P.15

MORPHOLOGY OF FRUIT AND SEEDS OF *Dipteryx odorata* (Aubl.) Willd (Fabaceae).

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The family Fabaceae is one of the largest botanical families, comprising 727 genera and 19,325 species with cosmopolitan distribution. The *Dipteryx odorata* species, popularly known as champagne in the Amazon region, is considered important for reforestation, and its wood is used in furniture industry, shipbuilding industry and agricultural implements industry. The almonds of the fruit are used in perfumes and cosmetics industry and besides, the fruit peel has a medicinal value. This work has the objective of characterize the morphology of the fruit and seeds of *Dipteryx odorata* collected in the Amazon region (MT), since these studies are important for the correct identification of taxa and for the study of the type of dissemination of seeds. For the biometric description of the fruit and seeds (length, width and thickness) were randomly chosen, from five different individuals, 50 fruit and their seeds, which they were individually measured with Mitutoyo digital caliper. The length was measured along the longitudinal axis; the width was measured in straight angle with the previous; and the thickness was measured in straight angle in the part thickest. *D. odorata* presents simple fruit of oblong drupe type, slightly elongated on average 53.93 cm; 29.74 cm of width and 29.81 cm of thickness. They are monospermic and dry fruits, composed of fibrous epicarp, mesocarp and endocarp belatedly dehiscence after decomposition of the mesocarp. It presents resin bags throughout the endocarp. The seeds of *D. odorata* are constituted by elliptical almonds, dark brown coloration, with an average length of 32.62 cm, a width of 11.75 cm and thickness of 8.53 cm. They present a smooth surface, however with time they darken and create wrinkles. Published studies about the biometric characterization of fruits and seeds of Amazonian forest species are still restricted, in relation to the large number of existing species. This lack of information creates problems, since one cannot extrapolate information obtained in other regions for local species, which often occurs.The family Fabaceae is one of the largest botanical families, comprising 727 genera and 19,325 species with cosmopolitan distribution. The *Dipteryx odorata* species, popularly known as champagne in the Amazon region, is considered important for reforestation, and its wood is used in furniture industry, shipbuilding industry and agricultural implements industry. The almonds of the fruit are used in perfumes and cosmetics industry and besides, the fruit peel has a medicinal value. This work has the objective of characterize the morphology of the fruit and seeds of *Dipteryx odorata* collected in the Amazon region (MT), since these studies are important for the correct identification of taxa and for the study of the type of dissemination of seeds. For the biometric description of the fruit and seeds (length, width and thickness) were randomly chosen, from five different individuals, 50 fruit and their seeds, which they were individually measured with Mitutoyo digital caliper. The length was measured along the longitudinal axis; the width was measured in straight angle with the previous; and the thickness was measured in straight angle in the part thickest. *D. odorata* presents simple fruit of oblong drupe type, slightly elongated on average 53.93 cm; 29.74 cm of width and 29.81 cm of thickness. They are monospermic and dry fruits, composed of fibrous epicarp, mesocarp and endocarp belatedly dehiscence after decomposition of the mesocarp. It presents resin bags throughout the endocarp. The seeds of *D. odorata* are constituted by elliptical almonds, dark brown coloration, with an average length of 32.62 cm, a width of 11.75 cm and

thickness of 8.53 cm. They present a smooth surface, however with time they darken and create wrinkles. Published studies about the biometric characterization of fruits and seeds of Amazonian forest species are still restricted, in relation to the large number of existing species. This lack of information creates problems, since one cannot extrapolate information obtained in other regions for local species, which often occurs.

FS11.P.16

Distribution Range of Thinouia myriantha Triana & Planch (Sapindaceae)

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The Sapindaceae family is composed of species with different life forms, such as vines (*Serjania* Miller, *Paullinia* L.) and
trees (*Talisia* Aublet and *Cupania* L.). Thinouia. (Sapindaceae, Paullineae) is a small genus of woody vines with a Neotropical distribution including Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guyana, French Guyana, Mexico, Panama, Peru, Suriname and Venezuela in tropical rainforest. This study aimed to verify the distribution and environmental preferences of *T. myriantha*. We completed a census of lianas in permanent plots totaling an area of 5km^2 from southern central Amazonia at São Nicolau Farm, Cotriguaçu, Mato Grosso (09°49'11.1"S, 58°15'31.4"W, mean annual temperature = 25°C, annual rainfall = 2034mm with 6-month dry season). At the same site, we collected lianas along 6km^2 of access trails to our permanent plots to increase the chance of encountering species of Sapindaceae, and thereby compile a complete list of species. The vegetation is a tropical rainforest, with areas both dense and open. The site is considered a "depression interplateau of the Southern Amazon", being a vast lowered area with altitudes ranging 200 - 300m absl. We found 36 individuals of *T. myriantha* from 1.0 to 3.0 cm in diameter at 1.3 m above the soil. The geographical distribution of this species previously was only found in northern Brazil in the states of Acre and Pará, both in the Amazon biome. This is the first time that the species has been sampled in central Brazil and in environments with elevation below 300m. To estimate the complete distribution and environmental conditions of growth, we analyzed data from 16 national and international herbaria, gathering data on elevation, temperature, precipitation, and environmental circumstances. To define the full range of the species, we will characterize the climatic envelope in which it currently occurs. The potential range may exceed this maxima although it is anticipated to be most often found within its climatic optimum. We have expanded the known distribution with our samples of *T. myriantha* to include Central Brazil.

FS11.P.17

Characterization of the genetic diversity of *Cedrela fissilis* in the Lagoa do Peri Municipal Park on the Island of Santa Catarina, Brazil

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Cedrela fissilis, is recognized for its high quality wood and for its economic importance, having been greatly exploited and as a consequence it is found on the endangered species list (IUCN). The objective of this study was to analyze the genetic diversity and maintenance of this diversity in one population of *Cedrela fissilis* in a protected area on the Island of Santa Catarina. In this study the characterization of the genetic diversity was carried out with 52 adult individuals and 52 juveniles. The study area is located in the Lagoa do Peri Municipal Park situated on the southeast coast of the Island of Santa Catarina. The genotyping was done through isozyme electrophoresis and the estimates of genetic diversity indexes for *C. fissilis* populations were obtained from allele frequencies of 34 alleles distributed into 11 loci. In relation to the number of alleles per loci, the values were close to 2.82 for adults and 2.73 for juveniles. The mean percentage of polymorphic loci was 72.7% (±1.3%), showing a high polymorphism, which demonstrates a need for genetic conservation of this population. The observed heterozygosity in the *C. fissilis* population, in adults and juveniles, was 0.265 and 0.230 respectively, which was smaller in juveniles. The individuals, both adults and juveniles, presented fixation indexes of 0.150 and 0.112 respectively, these numbers indacate endogamy, where a population loses around 13.3% of its diversity per generation. The genetic divergence between generations was characterized with a low value of (0.018). This value combined with the genetic flux between generations (Nm=3.41) and the size of neighbors (Nb=22), show that this population has a high capacity for polinization and establishment of new populations with the same levels of diversity. This study area proves to be a potential area for the maintenance of genetic diversity and conservation of the species.

FS11.P.18

Genetic diversity and landscape analysis in nine natural populations of *Cedrela fissilis* Vell. in the Deciduous Forest of the state of Santa Catarina, Brazil

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Cedrela fissilis Vellozo is a tree species, which sheds its leaves and belongs to the Deciduous Forest. Its wood was largely exploited and its environment is one of the most fragmented in the state. The species is found on the endangered species list (IUCN). Fragmentation is recognized as an important factor, which threatens the survival of long-term. Thus, the objective this study was to evaluate the landscape composition and the effect of fragmentation on the genetic diversity of *C. fissilis*, in order to generate information for its conservation. In this study nine natural populations of *C. fissilis* were sampled. For each population 50 individuals were genotyped using isozyme electrophoresis. The surrounding landscape was analyzed with a 4km radius buffer using the program ArcGis 9.2, and based on the map FATMA 2005 of land use and cover. A PCA analysis was used to test the association between the genetic diversity indexes and landscape data, which include the variables, number of fragments, mean fragment size, percentage of reforestation cover, pastures, agriculture and urbanized areas. A high genetic diversity was found for all populations (A = 2.63 ± 0.25; 39 alleles in 12 loci; P99% = 0.82 ± 0.10; Ho = 0.190 ± 0.040; He = 0.241 ± 0.036), as well as a high fixation index (f = 0.215±0.098). The analysis showed high association between the variables expected heterozygosity, fragment size and exclusive alleles. In general, populations with large fragment sizes (1378.51 ha) and low fragment numbers, present higher diversity indexes and lower fixation indexes. These data suggest that larger fragments and a smaller number of fragments are related to the maintenance of genetic diversity. Thus, fragmentation is shown to have a negative effect on the diversity of *C. fissilis*, indicating that it is important to conserve large existing fragments in the region.

FS11.P.19

SPATIAL DISTRIBUTION AND REPRODUCTIVE DYNAMICS OF FRESHWATER TURTLES IN ARAGUAIA RIVER (GOIÁS).

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Monitoring is an effective tool to provide information regarding the reproductive dynamics and to contribute with management for different species. In this work, we used monitoring data for Amazon turtle (*Podocnemis expansa*) and for tracajá (*Podocnemis unifilis*) that occur in the Araguaia River in order to test the influence of climatic and physiographic data on the reproductive dynamics of these species. The monitoring was done annually by the RAN/ICMBio since 1985 and the data series available were divided into two time series: i. 2000 to 2004, which refers to both species of turtles throughout the river channel and ii. 2005 to 2008 which refer only to the Amazon turtle in the Middle Araguaia. Climatic variables (precipitation and air temperature) did not explain the variation in the number of nestlings over the years. Beach area estimated by LANDSAT image did not determinate the choice for nest areas by females. Spatial analysis indicated that the monitored area in the Middle Araguaia have 90% of natural vegetation preserved. The increasing of land use by 46% across the river did not influence the amount of nests only in the Middle Araguaia ($p = 0.7$, $R^2 = 0.2$). Monitoring in less preserved areas such as Lower Araguaia river have been gradually ended but could generate important indicator regarding to nesting areas and land use. Information gaps that could assist in understanding the use of these beaches by these species are identified and could drive future management actions for the two species and to preserve those areas along the river more exposed to human action.

FS11.P.20

Rich and rare ain't the common share. Describing biodiversity and informing conservation practices for South American anurans.

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Current claims of a biodiversity crisis demand immediate conservation actions. These require the identification of priority sites for conservation, which can be based on species richness patterns. Rarity, measured by the size of species' geographical ranges, is also frequently used as a single or complementary criterion. For instance, hotspots for conservation have been defined using either one or the other criterion. Here we use a new and simple tool, range-diversity plots that simultaneously analyze species richness and range size, to identify a set of richness-rarity sites. We applied this tool to the anurans of South America and show how it can be readily used to inform conservation practices. Also, we evaluated the representation of these sites within the protected area system. We built a presence-absence matrix from the anuran range maps overlaid by a 1º-resolution grid and recorded the number of species and the average range size for assemblages at each cell. South American anurans show congruent patterns between richness and rarity, with rich-rare sites harboring high numbers of species averaging small range sizes. Nonetheless, there are also poor-rare sites that contain few species averaging small range sizes. Both sets of sites are poorly represented in the protected area system. We show that the South American protected area system can be improved by considering patterns of richness and rarity simultaneously, which can be easily described for a quick assessment of biodiversity at geographic scales and to compare against and contribute to the definition of conservation priorities.

FS11.P.21

Using the soil fauna as bio-indicator of different recuperation processes of mining areas in Porto Trombetas, Pará State, Brazil

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The destination of residuals from mineral extraction is one of the major problems of bauxite mining. This activity originates residuals of difficult colonization: the sterile layer which consists on that above the mineral layer; and the residual from bauxite washing which is stored in tanks. As soil fauna community is sensitive to changes related to land use and management, it is a good indicator for systems in recuperation. This study aimed to compare the development of different types of reforestation (on sterile and on residuals tanks) during three years of monitoring (2007, 2008 and 2009). Additionally, we intend to investigate more appropriated methods in order to conserve tropical forests threatened by mining. We used meso- and macro-fauna as indicator of quality and complexity. The field experiment was located at Saracá bauxite mine, in Porto Trombetas (Brazil). Five treatments were analyzed on reforested areas on sterile with different years of settlement and the other five on residuals tanks with different levels of fertilization. We collected the soil fauna during the dry season (July to September) using seven pitfall traps (i.e. sample unit) per treatment. These traps were placed in transects and distanced five meters from each other. The invertebrates were classified and the follow variables estimated for each sample: number of individuals in trap/day, mean and total richness, and diversity's indexes (Shannon and Pielou). According to the analysis of variance (ANOVA), treatments on sterile substrate showed difference from those on tanks ($p<0.05$). Moreover, we could observe a great difference on mean richness (S) between treatments with highest (S = 13.86) and lowest levels (S = 5.86) of fertilizer application. Higher richness on residuals tanks was related to fertilization which promotes an increase on vegetal growth, litter input and enhancement of nutrients cycle that could support a richer soil fauna community.

FS11.P.22

Do national red lists induce prioritization of research on endangered species? A case study on Brazilian vertebrates

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Endangered species lists are tools for conservation policy worldwide. The objective of red lists is to stimulate protection of listed species, usually through legislation and management. They are used by environmental agencies to enforce or sustain decisions that help to protect habitats and populations of threatened species from environmental impacts or for establishing conservation priorities. However, successful conservation also depends on knowledge and we could expect that red lists should induce the scientific community to increase research on endangered species. Scientific knowledge reduces uncertainties in conservation decisions and in management outcomes. We investigated whether the publication of the Brazilian Red List induced a response by the Brazilian scientific community in terms amount and focus of publications on endangered species. We compared the scientific production on endangered vertebrates before and after the publication of the Brazilian Red List of Endangered Species in 2004. The number of published papers on listed species (ESP) within four major vertebrate group (fishes, amphibians, birds and mammals) and also the total number of papers (TP) in each group was surveyed from 1998 to 2010 in the Scopus database and in additional selected journals. We examined the abstracts of all ESP to determine whether they had a conservation focus or not. There was a significant increase in the number of ESP only for Amphibians and Birds ($p<0.05$), however this increase was smaller than the general trend for TP on Brazilian Amphibians or Birds. There was no increase in the proportion of ESP relative to the total TP of each vertebrate group and neither in research done under an applied conservation focus. These results indicate little effect of the Brazilian Red List on the scientific production on endangered species, and call for political initiatives to induce research and increase academic interest on endangered species.

FS11.P.23

Short-Term Effects of Visitor Trampling on Aquatic Macroinvertebrates in a Brazilian Ecotourism Karst Region

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Tourism has increased in many natural areas of the world and scenic beauty and biodiversity are considered the main attractions. Despite this growth, little is known about the environmental impacts associated with the touristic activities. In order to evaluate the potential risks of human visitation on aquatic macroinvertebrate communities, we investigated the effect of trampling using two short-term experiments conducted in a Brazilian ecotourism karst region. Our colonization experiment, using bricks as artificial substrate, allowed us to evaluate both the direct effect of trampling and the recolonization capacity of fauna. Our drift experiment allowed us to evaluate the drift rate of macroinvertebrates and organic matter under the effect of trampling. Analysis of variance of richness, abundance, abundance of the most abundant taxa (*Simothraulopsis*, *Callibaetis*, Ephemeroptera and Diptera) and community composition showed that trampling immediately affects macroinvertebrate community structure and that the intervals between the peaks of visitation (5 days) are not sufficient to complete community restructuring. Organic matter and macroinvertebrate drift increased significantly with trampling. Considering that bathing areas receive thousands of visitors every year and that intervals of time without visitation are nearly nonexistent, we believe that the negative effects on the macroinvertebrate community occur in a cumulative way. Finally, we discuss some easily implemented measures that could potentially be used for low impact management of tourism activities in aquatic environments.

FS11.P.24

EVALUATION OF THE USE OF COMMERCIAL TECHNIQUES OF BROMELIADS CULTIVATION TO ENABLE ITS USE IN ENVIRONMENTAL RESTORATION: PRELIMINARY RESULTS

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Deforestation, an anthropic action related to development, caused loss of green coverage, of *habitat*, decrease of air quality, reduction of watercourses level, among other local and global changes. Actions aiming to restore the environment, called environmental restoration (ER), generally use woody species of trees, but the incorporation of herbaceous species is little studied. A family of herbaceous plants that provide a microenvironment that facilitates the entry of plant and animal species is the family Bromeliaceae because most of its species have a tank that stores water and nutrients. It is therefore expected that the species of this family can assist ER process. Thus, the knowledge and development of cultivation techniques of that family are fundamental to provide plants to be used in future projects intended for the reintroduction of species of this family in natural environments. This project aimed to evaluate the use of commercial techniques of Bromeliaceae cultivation to enable its use in ER projects. We prepared a list of bromeliads which occur in Rio de Janeiro and, subsequently, we sought to become familiar with its dynamics of growth as sprouting, flowering, fruiting, and seed production. We visited cultivators and producers to evaluate their techniques of commercial cultivation. We observed the diversity of growth and became familiar with the abiotic demands of the species followed. Visits to collectors added information about the dynamics of the species viable for ER. Thus, we concluded that it is feasible to produce bromeliads to use in ER, and apparently the most favorable form of production is sprouts induction, since seed production is slower. The next steps of the project include visits to locations with ongoing ER processes, survey of native bromeliads with preference for use of endangered species, and the implementation of a pilot experiment of reintroduction.

FS11.P.25

Conservation of palm forests in Northwestern Argentina: prioritization criteria

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Palm forests of *Copernicia alba* in Northwestern Argentina (NWA) are ecologically important since they are centers of high species diversity, supply food resource for frugivores during the dry season, and provide shelter and nesting sites. Our objective was to assess the conservation status of five palm patches in NWA: Reserve, Embarcación, Palma Sola, Vinalito, and Talar, and prioritize them according to their conservation status. We compared palm patches characteristics (*i.e.*, adult palm density, population size structure, seedling density, and presence of potential dispersers) to determine patches with greatest conservation needs. We randomly established 57 plots of 0.05 ha to survey adult palms and 59 plots of 0.01 ha to survey seedlings. We collected feces and identified species that consume palm seeds. We analyzed the data through Generalized Linear Mixed Models and Kolmogorov maximum likelihood test to determine if population size structures fitted a bell-shape distribution or a reversed J-shaped distribution. Our results show that three palm patches do not have an adequate conservation status. Talar and Embarcación patches have a better conservation status based on their population structure (reversed J-shaped) and palm density (> 200 individuals/ha). Therefore these two palm patches should be prioritized in conservation strategies and given adequate protection. Reserve and Palma Sola patches have the highest number of species that consume seeds, but palm density and structure are not adequate to ensure *C. alba* viability. Vinalito is the palm patch in worst conservation status because of its low palm density, bell-shaped population structure, lack of seedlings and no species that consume palm seeds. Given the high rate of forest transformation in the Dry Chaco it is necessary to prioritize the protection of palm patches to ensure the conservation of many species that depend on this habitat type.

FS11.P.26

Conservation by use of Caraguatá (*Bromelia antiacantha*): production of fruits and management of natural populations in the Araucaria Pine Forest.

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The Araucaria Pine Forest is one of the most threatened ecosystems in the Atlantic Forest biome besides containing numerous resources that have been exploited by human populations since before Europeans arrival. Within the medicinal plants that possess great potential use in the Araucaria Pine Forest is the *Bromelia antiacantha*, a species that belongs to the Bromeliaceae family. The species presents several use characteristics including food (fruits, palm heart), ornamental (live fence), industrial (manufacture textile fibers, ropes, and soaps), and medicinal qualities (expectorant syrup made from the fruits). With the objective of evaluating the perspective of conservation by use beginning with the exploitation of the species fruits, the fruit production of a population of *B. antiacantha* was followed in the National Forest of Três Barras, Santa Catarina, Brazil. The infructescensces were counted in nine 800m^2 permanent plots in 2010 and 2011. In 2010 the there was an average of 195infructescensces per ha and 259infructescensces per ha in 2011. Considering the possibility of exploiting 50% of infructescensces (97.5 and 129.5 infructescensces respectively), the estimated productivity is 243.75kg of fruit for 2010 and 323.75kg for 2011. The production of syrup would be 975L in 2010 and 1295L in 2011. Extracting the costs of ingredients, the brute income for the production of expectorant syrup in 2010 would be R$1,950.00 per ha and 2,590.00 in 2011. The estimates of production and economic assessment indicate that the exploitation of fruits for this use could be an economically interesting activity, favoring conservation by use. However, complementary studies to establish sustainable management strategies are still necessary, primarily for the assessment of the effect of extraction on the genetic diversity and natural regeneration of the species, the availability of the fruit as a resource for fauna, as well as the consumer market and production costs of the expectorant syrup.

FS11.P.27

Acting against "*savannization*" process: a northern Amazon study case

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Some coupled carbon/climate models are predicting globally significant changes in Amazon carbon and water cycles, including widespread forest collapse and conversion to savanna, for the near future. Those changes would be due to global warming-induced droughts, and would occur mainly in eastern and southern Amazonian margins. Protected areas seem to play a major role in climate-vegetation balance, acting as barriers to deforestation thus avoiding the "*savannization*" effect. In an attempt to test the hypothesis that within protected areas without fire events and under favorable climate the forests are expanding over savannas, we investigate the dynamics of forest-savanna boundaries over the last decades, in a strictly protected nature reserve (ESEC Maracá) that lies on a great biogeographical and climatic boundary in northern Amazonia, Roraima/Brazil. To the west of Maracá are forests from Parima Hills to upper Orinoco, while to the east are plains of open savanna grassland part of ''Rio Branco-Rupununi'' savanna complex, stretching towards Guyana and Venezuela. A 20-year Landsat-5-TM time series was used for a multitemporal analysis comparing the mean extention of savanna islands interspersed into forest matrices from 1986 to 2006. The spectral linear mixture model was applied to derive soil fraction images enhancing the discrimination of target areas, followed by segmentation/region classification approach. Overall areal coverage of savanna islands decreased from 746 to 550 ha from 1986 to 2006, with an average reduction of 2.62 (± 8.91 sd) ha per patch. As 70% of the reducing savanna patches measured less than 5 ha we might expect that keeping such rates and the management strategies, these little Maracá savannas would be quickly replaced by forests. This information will be valuable to feed models to predict changes on biomass and carbon stocks, simulating variations in factors responsible for transitions in savanna-forest boundaries and its inferences on future climatic changes.

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FS11.P.28

What Can Dragonflies Tell Us About the Brazilian Forest Legislation?

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In Brazil, riparian forests are protected under the form of Permanent Preservation Areas, however changes have recently been proposed to the Brazilian Forest Legislation which would reduce the required minimum width of riparian vegetation. This proposal generated a demand for information on the response of biodiversity in relation to the width of the forest that borders water bodies. We ask if the community of Odonata varies depending on the width of the forest, according to the current Forest Legislation. We used composition data of Odonata from 45 streams in a highly fragmented landscape in the central Brazil to test the hypothesis that composition of the community of Odonata differs mainly in the extremes of environmental integrity in riparian forest classes evaluated. In order to test if there are differences in the values of the species richness among the three classes of width of riparian forests we applied the analysis of variance (ANOVA). Analysis of Similarity (ANOSIM) was used to determine the statistical differences between species composition and riparian forest classes using the Jaccard index. We detected no relationship between species composition and richness, and width of riparian forests. Among potential factors that may be related to this result include: i) predominance of generalist species, ii) the influence of historical processes and biogeography and iii) the landscape setting.

FS11.P.29

Occurrence of *Aechmea nudicaulis* in the urban environment of Rio de Janeiro municipality

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The behavior of organisms and populations in urban areas may differ from that observed in forest remnants. In this context, urban ecology emerges as the aspect of ecology addressed to the study of organisms in the cities. The municipality of Rio de Janeiro is the second most populous in the country and stands out due to forest remnants composed mainly of secondary forests and surrounded by urban areas. The species studied, *Aechmea nudicaulis* (L.) Griseb. is a bromeliad with wide distribution, occurring in *restingas* and forests. This species, however, is also found as an epiphyte on trees in the urban areas of the municipality aforementioned. This study aimed to determine the occurrence of the species in an urban area of Rio de Janeiro. We conducted a survey of the occurrence of that species, and phorophytes were located along a defined urban area, including streets, parks and squares. The phorophytes with *A. nudicaulis* were numbered and mapped. The number of ramets and fragments per phorophyte were counted. We verified that *A. nudicaulis* occurs throughout the study area, with its presence registered in 434 phorophytes. We analyzed the density distribution of phorophytes, verifying that the three most important spots of high density are located near areas with remaining forest cover, with density values close to 75, 40 and 30 ramets per hectare. There are areas near remnants with low-density, indicating the influence of other factors in this distribution. We will carry out a taxonomic identification of phorophytes and an investigation of factors such as preference for phorophytes species and abiotic factors. We conclude that *A. nudicaulis* occurs in the municipality and its distribution is related in part to the proximity of forest remnants, however, there are other factors related to its distribution and density that will be further evaluated.

FS11.P.30

Effective population size for seventeen populations of *Ocotea catharinensis* Mez. (Canela preta) in the state of Santa Catarina

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Ocotea catharinensis Mez. (Lauraceae) is a species characteristic of the Atlantic Rainforest. It has a long history of exploitation for timber. In addition to being in a highly fragmented environment it is on three endangered species list. Due to its threatened situation, the *Ocotea catharinensis* was chosen for a study on its genetic diversity and structure for the Floristic and Forest Inventory of Santa Catarina. The objective of this work was to estimate the effective population size (N_e) in order to establish conservation actions in the state of Santa Catarina. In this study 17 populations were evaluated, where 50 individuals from each population were sampled, and ten isozyme systems were used with a TC buffer. Basic diversity indexes were estimated with basis on allele and genotypic frequencies. With the fixation index (f), estimates of an effective population size (N_e) were obtained for reference values of 50, 500 and 1000. The mean effective population size was 43 individuals, for a sample size of 50, with evidence of endogamy and genetic drift. The mean value of a N_e of 50 was 59 individuals (± 6), 592 individuals (± 64) for a N_e of 500 and 1,184 individuals (± 128) for a N_e of 1,000. It was possible to obtain densities (individual/hectare) for seven fragments. All of the seven fragments had number of individuals sufficient to reach a N_e of 50. Five of these fragments with known densities had numbers of individuals superior to the estimations of N_e of 500 and N_e of 1000. The results permit the indication of priority areas for creations of Conservation Units and seed collection. Conservation strategies for this species should be prioritized action that favors the increase in population size and amplifies the genetic flux between populations.

FS11.P.31

Good practices of the Ouricuri palm tree: productivity analysis of fruits of managed palm trees in the Brazilian semi-arid

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The Ouricuri palm tree **(***Syagrus coronata* (Martius) Beccari), which is practically restricted to the North-eastern region of Brazil, occupies predominantly sandy and silted soils, it thrives under adverse climatic conditions, and it is resistant to fire. Food is made from its fruit, and articraft articles are made from its green and ripen leaves. The Ouricuri fruit is used to make fodder for the cattle, food for the human being, and it is eaten by wild animals. In extreme climatic conditions the leaves of this palm tree are also used as fodder for the cattle. The production of leaves and the impact of harvesting leaves on fruit productivity were analyzed in this study. Based on a sample of 30 managed palm trees and 30 trees that were not submitted to any type of management for at least 24 months, the following procedures were conducted: phenological observations, countings of the number of ripen leaves, countings of the number of ripen fruit bunches, number of ripen fruits produced by bunch, individual sizes of each fruit, as well as the individual weight of each fruit. Data produced evidence of reduced fruit production in tree populations that were submitted to management. Although the average weight of fruits of managed palm trees have not been significantly different, the production of fruits was significantly larger in non-managed trees, what led to a larger biomass production. The study concludes that non-managed individuals invest more energy in its reproduction. Considering that the production of fruits in managed palm trees was still high, harvesting leaves to feed cattle does not appear either to affect the natural regeneration of the palm tree or to reduce the amount of food resources available to the associated fauna.

FS11.P.32

Effect of species abundance and seasonality on hunting practices in the Rio Xingu Extractive Reserve, Terra do Meio, Brazilian Amazon

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The hydrological cycles in the Amazon Forest affect the flooded area and phenology of plants, with effects on resource abundance. Such changes affect the diet, mobility and abundance of game species. The purpose of this work was to evaluate the effect of seasonality and abundance of fauna on human hunting activities. The study was conducted in the extractive reserve Rio Xingu. We used cameras trap to evaluate the relative abundance of mammals, with a total of 110 days of field activities (4 bimonthly trips in 2011, from May to September; totaling1,165 trap-days). To assess which species were hunted, we used semi-structured interviews evaluating hunting activity (107 interviews). In the rainy season, we found a significant correlation between abundance and number of hunted animals (Pearson's $r = 0.87$, $p = 0.02$, 1,000 permutations) but not in the dry season ($r = 0.43$, $p = 0.12$). Thus indicating that although we did not find significant differences in abundance of the most hunted species (9 species; Mann-Whitney test, P-values = 0.33-0.95), hunting activity differed between seasons. During rainy season but not during dry season, hunters consumed mainly the most abundant species. This pattern was probably influenced by seasonal movements of the most hunted species during rainy season - T. peccary (45% of all animals hunted). This ungulate moves into and out of flooded areas according the season. In the dry season this species moves away from floodplain areas, where the residences are located and where they hunt, thus becoming less available. During this season, the residents also rely more on other protein source, such as fish. Our results indicated that the evaluation of seasonal patterns of both hunting preferences and movements of game species might reveal relevant information for forest conservation, hunting management and food security of the local populations.

FS11.P.33

FAUNA MONITORING IN PARÁ - BRAZIL: THE RELATIONSHIPS BETWEEN FAUNA AND ENTERPRISE AT A PROTECTED AREA

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The results of Fauna Monitoring Program developed in Salobo Project, a copper mine inserted at Tapirapé-Aquiri National Forest (FLONA do Tapirapé-Aquiri), Marabá, Pará, Brazil, are presented relating the integration between the enterprise and the local fauna. The Program was implemented during the years of 2009 and 2011, considering Mirmecofauna, Apifauna, Herpetofauna, Avifauna and Mastofauna. Each fauna group was sampled using specialized techniques recognized worldwide. Mirmecofauna and Apifauna richness after suppression of vegetation were equivalent with previous data (257 and 109 species, respectively). Rates of Herpetofauna richness (93 species) were higher than those of other studies in Amazonia. For Avifauna were sampled 241 species, with a small decrease in the records of certain endangered species over time monitoring. For the Quiropterofauna, 53 species were registered at monitoring, corresponding at 50% of the expected for the region. The impact on bats at the study area is temporary, so it is expected that the community of bats will adapt to new realities and return to the previous level. For non-flying small mammals, the results were almost the same along the study, presenting 18 species among sensitive and rare species and genera in taxonomic revisions. For large mammals, 39 species were recorded during the monitoring, but changes in composition and species richness with time were detected. For the studied groups, on general, the diversity indices showed strong seasonal variability, but no significant changes related to vegetation suppression in Salobo's Project. The results may indicate a change in biological systems, in response to the impact generated or caused by local seasonal characteristics. Despite the installation of Salobo Project, the region of National Forest Tapirapé-Aquiri presents high diversity of tropical fauna, with several endangered species, bioindicators and top predators of the food chain.

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FS11.P.34

Low Primate Diversity and Abundance in Northern Amazonia and Its Implications for Conservation

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Large areas of the Rio Negro basin in Amazonia are covered by continuous tracts of tropical forest but have few primate species. This is anomalous considering the general relationship between area and number of species. One possibility is that much of the forest is unsuitable habitat for most primates, and the area of suitable habitat is much less than the forested area. This has important consequences for the design of reserves and predictions of the consequences of climate change, which tend to be based on broad categories based on satellite images, and not on information of species distributions within those broad categories. The study was conducted through diurnal and nocturnal line-transect surveys in the Biodiversity Research Program 25-km^2 permanent grid in Viruá National Park, which has vegetation associations typical of much of northern Amazonia. The highest primate diversity and abundances occurred in tall terra-firme forests (58%), whereas inundated forests and scrublands, which cover 42 percent of the survey grid, and 90.8 percent of the Viruá National Park, had virtually no primates. This suggests that parks and reserves in north-western Amazonia will have to be very large to maintain viable populations of most primates and their ecological interactions and that very broad habitat categories are not sufficient to make predictions about actual and future suitability of areas for primate conservation.

FS11.P.35

The Impact of smallholders Vs. Large-scale companies in oil palm plantation expansion in Sumatra utilizing the 2000 & 2010 Land Cover maps of Insular Southeast Asia

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Oil palm expansion in the Indonesian island of Sumatra had a significant impact on land use/cover change and received considerable attention by researchers to estimate the spatial extent of land conversion and the impact of such land use/cover change on biodiversity and ecosystem services. Between 2000 and 2009, the area of smallholder oil palm plantation has risen rapidly by 11.1% compared to 5.5% from private enterprise (IPOC 2010). The area of oil palm cultivation currently under smallholder production is estimated at 3 million hectares, approximately 40% of total oil palm cultivated area in Indonesia. Given that 1) little is known about the environmental impacts of oil palm development by smallholders and 2) the role of smallholders in Indonesia is expected to increase, we decided to investigate the environmental impact of oil palm smallholders by assessing their role in land use change activities, in particular, the extent of land cover and forest conversion into oil palm plantations. In this paper we focus on the land use/cover change in the island of Sumatra due to both smallholders and large scale activities utilizing the 2000 & 2010 land cover maps of insular Southeast Asia and the GIS ownership layers provided by the Center for Planning and Regional Developments (IPB, Indonesia). The result of this paper is a change detection analysis for the island of Sumatra highlighting the overall expansion of plantation/regrowth class caused by smallholders and large scale activities and the impact of land use/cover on different land cover classes.

FS11.P.36

Is extinction forever?

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As conservation biologists we are concerned with averting extinction of organisms. But in recent decades the term "extinction," once restricted to mean the complete disappearance of a species, has been used with various other meanings, some of which may mislead policy makers and the lay public into thinking that extinction is not a dire problem. In this light, we explored what researchers mean when using the term "extinct." An examination of the scientific literature and public media shows that "extinction" has become conflated with the relatively more benign term "extirpation," even though the latter is what is meant in the vast majority of cases. As a result of changes in definitions, researchers have adopted modifiers to the term "extinction"—which in principle is an absolute like "unique"—to form compound terms such as "global extinction" and "local extinction," but this practice has nonetheless led to miscommunication, with some extirpated species labeled as extinct because the modifier is dropped or ignored. For example, a sample of only five studies of Neotropical birds yielded 158 species designated "extinct" even though all of these species are extant, and in the IUCN's terms 92% were of "least concern." This issue is not merely about semantics. The gap between scientific findings and public understanding is widening, and without more of an effort to communicate clearly we scientists must accept part of the blame. After all, by dubbing species lost from a small patch of forest as "extinct," what message are we sending? To many non-scientists, either a species has gone extinct or it has not. Conservation does not benefit from the public viewing our research as misleading, so we urge caution in how we as a community convey our message.

FS11.P.37

INVASION BIOLOGY AND UNMATCHED NICHES: WHAT DO THEY SAY?

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Ecological niche modeling can be used to predict the geography of species' invasions. It makes predictions of sites susceptible to invasion based on knowledge about the species' niche in their native areas. However, it is necessary to evaluate the models with the occurrence sites of the invaded areas. Very often, species' invasions cannot be accurately predicted, and two explanations are generally used. The first is that the species' niche changes within invaded areas (niche-shift hypothesis). And the second is that occurrences in the native range represent the realized niche, not the species fundamental niche (non-equilibrium hypothesis). Empirical evidences and theoretical frameworks suggest that in general, fundamental niches tend to be conserved during small to intermediate time scales (non-equilibrium evidence). In order to delve into the debate on niche shift vs non-equilibrium, we evaluated all published research articles that validated ecological niche models with species' invaded localities and/or evaluated niche overlap. We used ISI Web of Knowledge to collect the articles (a total of 61). The results show that the field (niche and invasion biology) is increasing over time and more important, that the niche-shift hypothesis was twice more used than the non-equilibrium hypothesis. This probably occurs because it is easier to infer that a species changes its environmental limits than that an important model's assumption is being violated. However, it is still necessary to evaluate others factors that results unmatched niches, such as scale (spatial, temporal and taxonomic), models and environmental variables. We claim that addressing ecological niche models constraints will help increase our capacity to predict invasive species expansion.

FS12.OC.01

Barriers to invasion: What limits introduced plant spread?

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Biological invasions have been increasingly recognized as a major threat to global biodiversity and to the integrity of ecosystems worldwide. This effect is especially seen on islands, which have high levels of endemism and greater vulnerability to novel species introductions. However, not all introduced species become invasive and the ecological factors that determine species invasiveness are still poorly understood. This research investigates the role of ecological interactions in promoting or limiting invasiveness by examining potential barriers to invasion in a suite of introduced ornamental plants in the islands of Hawai'i. Invasive, weakly naturalized and non-invasive species in three families (Acanthaceae, Apocynaceae and Bignoniaceae) were selected, for a total of 30 species, all of which have been present in Hawai'i for at least 50 years. Putative barriers studied included seed production, dispersal, germination, both in the lab and in the field, seedling survival in the field with or without competition, and seedling growth and photosynthetic capacity. Barriers varied by family and by species, however lack of seed production was the most common barrier, especially in the Acanthaceae (7 of 8 non-invasive species studied). Among species producing seeds, seed dispersal was rarely a barrier, and germination was not a barrier for any of the species studied. In contrast, seedling survival, especially in competition, was a barrier for some species, notably in the Apocynaceae. A generalized linear mixed effect model based on field seedling survival indicates that invasive species survived better in competition than non-invasive species. This may be explained by higher specific leaf area and faster development in invasive seedlings. In the families studied, most plant species that have failed to become invasive in Hawai‘i appear to be limited either by lack of seed production or weak competitive ability.

FS12.OC.02

Decreasing dung beetle diversity with changes in forest structure and diversity

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Human-induced changes in forest structure normally result in a reduction of species diversity. Dung beetles have been proposed as effective indicators of habitat change, and play important roles in ecosystem functioning of tropical forests. Here we analysed relationships between dung beetle richness and abundance with several measures of forest structure and composition, including canopy openness, leaf-litter mass and tree richness. We sampled 135 forested transects (300m) in Eastern Brazilian Amazon, encompassing a large gradient of forest degradation – from undisturbed, burnt and logged primary forests to recurrently degraded secondary forests. Trees, lianas and palms were measured and identified in a plot of 250x10m in each transect. Dung beetles were sampled with nine baited pitfall traps per transect. Hemispheric photographs were taken to access canopy cover, and 50cm quadrat samples of litter were taken to estimate litter mass. Data were analysed using dung beetles species richness and abundance as response variables and tree species richness and abundance, canopy openness and litter mass as explanatory variables. Positive and significant relationships were found between dung beetle species richness and both tree species richness and litter mass. Both plant species and litter accumulation can represent good proxies of habitat heterogeneity for dung beetles. Higher tree diversity, as well as larger deposits of leaf litter, may offer a greater variety of niche habitats and resource diversity (including rotten fruits and fungi, as well as microhabitat variation generated by litter accumulation for nesting and feeding conditions), and are characteristics often related with less disturbed areas of forest. The close association found between dung beetles and changes in forest structure and composition demonstrates that forest degradation can have profound impacts on the diversity of these ecologically important insects.

FS12.OC.03

Strength of plant-plant interactions among recruits varies over time in a wet tropical forest

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Negative density-dependence (i.e. negative effects among neighbouring individuals due to competition of the attack of pests and pathogens) has been claimed as one of the most important type of plant-plant interactions driving dynamics of tree communities during recruitment in wet tropical forests. Some studies, however, suggest that inter-specific interactions between light-demanding species are also apparent, especially in gaps. In this study we assessed the relative importance of processes of negative density-dependence (NDD) and inter-specific interactions between light-demanding species, during recruitment in a wet tropical forest (BCI, Panama), by using recent techniques of spatial point pattern analysis. Specifically, we aimed to know if we can detect spatial patterns indicative of these two plant-plant interactions and if their strength varied among the different censuses. We analyzed recruit cohorts sampled over an entire 50 ha plot (Barro Colorado Island, Panama) during six censuses from 1985 to 2010. To study the effects of the plant-plant interactions considered on recruit mortality we used both, univariate and bivariate pair correlation functions; g(r) and g12(r), respectively, and tested them against a null model of random-labelling (labels: alive vs dead recruits). To study the effects on growth we used the mark correlation function Kmm (r) and tested it against a null model of spatial autocorrelation in diameter at breast height (DBH). Our results showed that NDD prevailed in this tropical forest over the entire study period, but spatial signatures indicative of negative interactions between light-demanding species strongly appeared in those years in which unusually severe dry seasons associated with El Niño events increased canopy openings and light availability in the understory. It suggests that neutral interactions independent of species identities are prevalent in BCI, but they can be strongly disrupted by climatic events that impose a strong environmental filtering at local scales, and hence promote niche partitioning.

FS12.OC.04

A multilevel analysis of reproductive strategies of dioecious tropical trees: species, sexes, and individuals

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Phylogenetically related and sympatric tree species may present alternative reproductive strategies. Character displacement in reproductive phenology can allow coexistence reducing possible interference between these species. We studied the reproductive phenology of *Virola bicuhyba* and *V. gardneri*, two sympatric Nutmeg trees endemics in the Brazilian Atlantic Rain Forest. The individuals were measured and their phenology was followed for four years. Every month during two years we evaluated the crown area covered by flowers or fruits in relation with the total potential reproductive area. The relationship between reproductive effort and species, sex, tree size and light incidence was analyzed. The effect of tree size on the flowering time and flowering synchronization was also considered. *Virola bicuhyba* flowers annually with great variation in the flowering time per individual. Ripe fruits are available for of up to six months each year. *Virola gardneri* flowers and presents fruits every two years in synchronized episodes lasting two months. Different individuals reproduce every year and the population is temporally separated in two groups. Males present more intense flowering than females. Flowering intensity is weakly, but positively related with tree size and crown illumination only in *V. bicuhyba*. In the latter, large males are less synchronized. The sexes also present intra and inter-specific differences in their reproductive phenology. *Virola bicuhyba*?s flowering behavior has great variation in intensity and timing showing two extreme strategies partially related to the size of the individuals. This is the first study to evaluate the reproductive phenology of a population by assessing the behavior of the individuals separately. We detected unexpected patterns that other methodologies may be overlooking. Different reproductive strategies should be recurrent among highly related sympatric species and might help explain the high tree diversity and coexistence in tropical forests.

FS12.OC.06

Long-term Monitoring of Rock Bee Colonies in Biligiri Rangaswamy Temple Wildlife Sanctuary, India

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Honeybees play an important role in the forest ecology of tropical forests, besides supporting livelihood of the people. The indigenous Soliga community that resides in the research site harvests around 15 to 18 tons of honey per annum from wild. Rock bee colonies (*Apis dorsata*) are found along streams and the main host tree species are *Acrocarpus fraxinifolius*, *Albizzia odaratissima*, *Garuga pinnata*, *Terminalia bellerica* and *Syzigium cumini*.

To estimate the number of bee colonies, seventeen one-kilometre transects were laid along streams in different habitat types, and thirteen rock cliffs were marked permanently. Bee colonies were counted before and after harvest from 1995 to 2011 (seventeen years) to determine the interannual variability in colony numbers. Bee colonies were counted before harvest to understand the stock, and after harvest to estimate the proportion of harvested colonies. The density of bee colonies in the forest landscape coincides with the flowering season. After the flowering season, honeybees migrate to the agricultural plains, where crop plants are flowering.

Honey bee colony distribution showed distinct spatial variability related to habitat types. The highest densities of bee colonies were recorded in evergreen forests, followed by dry deciduous forests. The level of extraction was high in dry deciduous forest, followed by evergreen, and least in cliffs depending on accessibility. Results showed gradual decrease in bee colony numbers from 1995 to 2011. Across the year, overall number of bee colonies decreased in evergreen forest ($R^2 = 0.75$) and dry deciduous forest ($R^2 = 0.72$), which was significant. Bee colonies number remains more or less constant on rock cliffs ($R^2 = 0.12$). Results suggest that harvest of honey might not be influencing colony numbers and that use of pesticides in the agricultural area as well as the loss of nesting trees might have impacts on colony numbers.

FS12.OC.07

SharedS: a software to examine the influence of occasional and rare species on shared species metrics.

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The ability to determine the relative conservation value of human-modified environments is important and ecologists often base their comparisons on relatively simple metrics. One such metric is the proportion of species shared between primary systems and alternative land-uses. This intuitive metric has been used extensively, but it is very sensitive to occasional species. One solution is to remove low abundance species from analyses. However, we suggest that occasional species should also be considered as those occurring in few samples, independently of their abundances, and propose a new routine to remove these from analyses. To implement this we developed SharedS, a package with graphical user interface. The software works with data from a .csv file containing species in columns, samples in rows and the species abundances. It provides the following metrics: a) percentage of all species that remains unique to the primary systems; b) percentage of those species that occur at least once in the primary system that remains unique to the primary systems and c) percentage of species shared between primary and modified systems. These can be applied each time when sequentially removing singletons, doubletons and other abundance classes or when sequentially removing occupancy classes, both of which can be defined by the user. It is also possible to remove these abundance and occupancy classes from reference or target systems or both, according to the biological knowledge of the system The resulting estimates are compared by plotting mean values and confidence intervals (SE, SD, 95% CI) generated by bootstrapping. SharedS allows quick and simple comparisons of conservation value, and the robustness of comparisons based on shared species.

FS12.OC.08

Tree growth in a seasonally dry tropical forest along a rainfall gradient in Southern India

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To assess impact of climatic variation and change on growth of seasonally dry tropical forest trees we took a space for time approach. Along a rainfall gradient spanning about 600-1800 mm mean annual rainfall, we chose eight 1-ha permanent forest dynamics plots featuring tropical dry thorn, dry deciduous, moist deciduous and semi-evergreen forests. Given that dry forest trees grow slow, to detect minute girth changes we used dendrometer bands and measured girth changes in about 1000 trees every other month over 2 years. The gravimetric soil moisture of top 10 cm soil was also monitored simultaneously. Tree girth changes follow changes in seasonal site wetness. From dry through wet sites, the mean annual dbh of trees increased from about 1 (±2 SD) to 3 (±3.5 SD) mm. Thus the variation within sites is high and increased with site wetness. The growth rates varied widely among species. Significant wet to dry season shrinkages were observed, especially at the drier sites. Shrinkages too were found to be species specific. Exploratory analyses suggest that shrinkages are higher in species with dry site affinity. Shrinkages dictate a careful choice of the timing of annual growth measurements. Annual growth rates calculated from wet-to-wet or dry-to-dry season were found to differ by about 20-25%. Trees response to short term changes in water availability will be later integrated with their long-term growth response to rainfall fluctuations, while plant functional properties will be included to better understand species specific responses.

FS12.OC.09

Spatial patterns of trees are related with species traits in a Bolivian tropical dry forest

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Several factors (dispersal limitation, competition, demographic processes, environmental variables) may drive spatial patterns, and hence coexistence, of tree species in seasonally tropical dry forests (TDF). To disentangle which are the main drivers of tree spatial patterns most studies deal with one single map of a tree population, representing only one realization of the underlying spatial processes. To avoid this bias we analyzed tree spatial patterns of 18 tree species in a TDF in Bolivia using repeated samples. Our dataset comprises eight large permanent plots (400 m x 500 m) including all trees with DBHs above 10, 20 and 40 cm and analyzing scales of 1, 10 and 20 ha plots. Second-order density functions were computed to describe spatial patterns and to assign them as aggregation or repulsion types. The intensity and the scale of conspecific aggregation were correlated with species attributes (dispersal, abundance and size traits) and with growth, recruitment and mortality rates. At large scales, species associations with local topography (a proxy of soil water availability) showed positive associations with plateaus, slopes and valley bottoms while other species were independent from topography. At the plot scale, most species distributions were related to aggregation-repulsion processes. Species differed in the intensity and scale of conspecific aggregation, with some species showing significant clustering (*Anadenanthera colubrina*, *Centrolobium microchaete*) and others showing spatial randomness (*Machaerium scleroxylon*). With an increase of the species mortality rates, scale of aggregation increased for big trees, whereas it declined for smaller trees. This is consistent with a more intense association of smaller trees within suitable patchy habitats for regeneration, while larger trees experience density-dependent mortality. These results suggest differences in the species strategies to face competitive exclusion and thus may aid to explain the coexistence of several tree species in this TDF.

FS12.OC.10

Losses of native species in a Brazilian savannah invaded by slash pine

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Pinus elliottii Engelm., a tree species native to the Southeastern United States, is one of the main threats to the biodiversity in Brazil's Cerrado. The species is largely planted for turpentine and wood production. It escapes from cultivation and frequently colonizes natural sites surround the plantations, specially Cerrado wet grasslands. With the goal of estimating how the number of native species decreases as a result of *P. elliottii* in Cerrado vegetation, we sampled five sites colonized by *P. elliottii* in Santa Bárbara Ecological Station – SP. In each site we marked 10 plots 100m^2 in an invasion gradiente ranging from 0 to 100% covered by pine trees. In each 100m^2 plots we sampled five 1m^2 plots. We sampled native plants and the invader population in each plot. Native plants were classified in functional groups according to life form: graminoids, herbs, shrubs or trees (response variables). We also measured pine density, pine basal area (BA), canopy oppenness (% - OPEN) and pine needles depth (cm – NEEDLES) on the soil (explanatory variables). We tested the relationships between the variables performing linear regressions. The variables NEEDLES, OPENN, BA and pine tree density, showed high colinearity, and NEEDLES, that showed the highest R^2 values was select to the analysis. In all the five sites NEEDLES was the most important variable to predict the biodiversity decreases. In two sites we also noticed important relationships between the interaction of the variables NEEDLES and OPENN. We noticed that as the invasions increases, the grainoids, herbs, and shrubs, decreases in abundance. No effects were noticed for trees. We conclude that *P. elliottii* strongly changes the functional composition from Cerrado communities. It removes from the system mostly native plants that are not trees. We conclude that the thick pine needle layer presentes the main negative effects on the native plants.

FS12.OC.11

Forest structure and composition of one hectare permanent plot in Mount Papandayan, Indonesia

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Establising permanen plot is essential for studying the long-term dynamics of forest. A permanent plot of one hectar (100 m x 100 m) was established in a montane zone (2,000 m asl) of Mount Papandayan, West Java, Indonesia. The paper reports the results of the first census describing the structure and composition of vegetation. All trees with the diameter at breast height (dbh) of >= 10 cm were permanently tagged and numbered. The dbh and coordinate position in the plot were measured and determined for each individual. Species density, basal coverage, diversity and dispersion patterns were calculated. We found 30 species belonging to 18 families in the one hectare plot. The density and basal area of all individuals were 890 individu/ha and 52.9 m^2/ha, respectively. The Shannon-Wiener diversity index was 2.62. The distribution of individuals by dbh class shows an inverted J-shaped curve pattern. Lauraceace was the family with the highest contributor of species, i.e. four species. Four species with highest relative density were *Distylium stellare* (26.52%), *Neolitsea javanica* (10.79%), *Astronia spectabilis* (8.54%) and *Acronychia punctata* (7,64%). Meanwhile, four species with the highest relative basal area were *Distylium stellare* (37.33%), *Syzygium glomeruliferum* (8.63%), *Acronychia punctata* (7.7%), *Polyosma ilicifolia* (6.16%). The analysis of dispersion pattern shows that most species had clumped distribution. From long term repeated census, we expect to be able to elucidate species-specific characteristics that will serve as basis for screening species for forest restoration and parameterization of forest models.

FS12.OC.12

The relationship between abundance and range-size in Neotropical butterflies (Nymphalidae: Ithomiini)

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One of the most frequently documented patterns in ecology is a positive relationship between species abundance and distribution – that is, species that are more locally common tend also to be more widespread geographically. Nevertheless, there remain several important questions surrounding the generality of this ecological 'rule'. In particular, the majority of studies to date have considered vertebrate species of temperate regions, whereas the overwhelming majority of Earth's species are invertebrates found in the world's tropics. Using measures of species mean local density gathered from five rainforest sites in eastern Ecuador, as well as range-sizes estimated using ecological niche modeling techniques, I show that there is no overall relationship between abundance and range-size among species comprising a diverse, Neotropical insect community: clearwing or ithomiine butterflies in Ecuador. The pattern holds across several spatial scales, and after accounting for potential effects of close phylogenetic relationships. This is the first study of its kind for Neotropical insects, and among the first for a tropical animal group anywhere. I compare my findings with those from similar studies, and consider possible explanations for apparent differences.

FS13.OC.01

Nesting of black caiman in the Mamirauá Reserve, mid Solimões river, Brazil

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In the 80's, black caiman was classified as endangered. The species is currently considered with low risk of extinction, but conservation dependent. In the Brazilian Amazon *Melanosuchus niger* is abundant, yet there are few records about its biology and population status. In 2011 with support from Petrobras, through the Programa Petrobras Ambiental, we monitored nesting areas and collected data on nesting ecology in the Mamirauá Reserve. We visited 46 water bodies and found 214 nests, 23% of which were opened. The average clutch size was 28.6 ± 7.9 eggs (5-50, n = 51). Mean egg length was 82.03 ± 3.9 mm (52.28- 110.34, n = 1029), diameter was 50.07 mm ± 2.2 (27.16-76.69, n = 1029) and mass was 121.8 g ± 11.1 (94-210, n = 1029). These variables did not differ between water bodies, despite a trend in variation of egg masses. The total length of females captured ranged from 2.34 to 2.83 m (mean = 264.1 ± 16.6 m) and weight ranged between 39 and 70 kg (mean = 56.3 ± 11.3). We found a positive correlation between the mass of females and the number of eggs per clutch ($r^2 = 0.48$, $F = 140.8$, $p = 0.0027$). Predation was recorded in 76 nests (35.5%), man being the major predator (n = 39), followed by jaguars (*Panthera onca*, n = 12), "jacuraru" *(Tupinambis* sp., N = 11) and capuchin monkeys (*Cebus apella* n = 3). Eighty-eight percent of nests were found in ponds, following the pattern of distribution proposed by Villamarin and colleagues (2011). However we found nests in other environments such as small channels and bays, which are more vulnerable to hydrological variations. Therefore, we consider that in areas with great abundance the species may be more generalist in its choice of nesting sites.

FS13.OC.02

Effects of ENSO and temporal rainfall variation in the dynamics of regenerative communities over the old-field succession in a tropical dry forest

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The effects of the rainfall temporal variation on the successional dynamics of seasonal ecosystems are poorly understood. We studied the effects of inter-seasonal and inter-year rainfall variation on the dynamics in old-field succession of a tropical dry forest in Mexico. We focused on the effects caused by a severe ENSO in 2005. Permanent plots in a chronosequence of Pasture (abandoned cattle pastures, 0-1 years fallow age), Early (3-5 years), Intermediate (8-12 years), and Old-Growth Forest categories (three sites per category) were established. At each site, seedlings and sprouts of shrubs and trees (10-100-cm height) were identified, measured, and monitored over four years. Monthly rates of recruitment, growth, mortality, gain and loss of species were calculated per season, year, and successional category, considering the whole community and separating seedlings from sprouts, and shrubs from trees. Community rates changed in a complex way in response to rainfall variation, with almost no effect of successional category. Mortality and species loss rates peaked in the dry season of the ENSO year and were still high in the following year; however, after two rainy years mortality peaked in the rainy season. Growth, recruitment and species gain rates were higher in the rainy season but they were significantly reduced after the ENSO. Overall, seedlings exhibited a higher mortality rate than did sprouts while shrubs and trees exhibited similar rates in all analysed traits. The severe drought produced by the ENSO strongly impacted the dynamics and trajectory of succession, creating transient fluctuations in the abundance and diversity. Although such fluctuations were smoothed out by subsequent rainy years, there was a net decline in plant density and diversity in most successional stages. We conclude that strong drought events have critical consequences for regeneration dynamics, because they can delay the successional recovery of tropical dry forests in abandoned fields.

FS13.OC.03

The influence of structural contrast on beetle assemblages along tropical forest edges

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Forest fragmentation increases the proportion of edges between natural and modified habitats, where the edge effects are mainly determined by the structural contrast between adjoining habitats. Understanding ecological responses to different contrast and how this influences edge effects can provide information for the management and conservation of tropical forests. Response to edge effects and different adjacent habitats was studied in tropical lowland forests in Panama using beetles (Coleoptera) as focal taxon. The objectives were to investigate: 1) how distance from the edge affects forest beetle assemblages, 2) how beta diversity of beetle assemblages varies along forest edges, and 3) how the structure of the adjacent habitat (low or high contrast) affects the beta diversity of beetles along forest edges. Beetles were sampled between May 2007 and May 2008 using flight intercept traps at six transects at varying distances from the edge into the forest. Three sites were adjacent to coffee plantations and three to pastures. A total of 37,395 beetles, from 68 families, was collected. The families Curculionidae and Histeridae were selected to assess species level responses. Family and species richness did not vary in relation with distance from the edge. The relative abundance of beetles decreased at the edges in comparison to the interior of the forest and sites adjacent to coffee plantations had more beetles than sites adjacent to pastures. Using PerMANOVA, beta diversity was found to differ significantly among sites adjacent to either coffee plantations or pastures and at the edges of the forest. The beta diversity within edges was higher for sites adjacent to pastures than those adjacent to coffee plantations. This study highlights the influence of the adjacent habitat with low contrast to the forest in diminishing the harsh effects of edges on biodiversity in tropical forests.

FS13.OC.04

Palm distribution along environmental gradients in Bolivian lowland forests

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Palms provide one of the most important non-timber forest products in tropical ecosystems. Yet, we know little about their distribution patterns. In addition, plant species differ in their requirements of the environment. Ecologists have found different responses, mostly for temperate species, but data in tropical species responses are surprisingly scarce. This study aims to examine, with a broader regional view, the relative importance of environmental factors that could affect the distribution patterns and response curve shapes of seven palm species (*Astrocarium aculeatum, Attalea phalerata, Euterpe precatoria, Iriartea deltoidea, Oenocarpus bataua, Socratea exorrhiza,* and *Syagrus sancona*). Presence and abundance of these palms were registered in 220 1-ha permanent plots along environmental gradients in lowland Bolivia. For each plot, climate data were interpolated from weather stations and soil samples were collected. A set of 17 climatic variables were summarized into four environmental gradient axes using Principal Component Analysis. Logistic regression models predicted the probability of occurrence of these species along the environmental gradients. *E. precatoria* was the most abundant and the most widely distributed palm in the lowland forests. Palm species responded differently to each environmental factor and they were more strongly affected by climatic than by soil factors. Only two species showed unimodal response curves and the rest showed an increasing response to the rainfall gradient. Given that all species were affected by rainfall, and the large climatic changes predicted for the tropics, it is important to monitor species distributions in relation to climate. These results agree with the notion that species response types to environmental gradients will differ among species and among factors considered. In conclusion, clarifying distribution patterns of palm species, in relation to environmental variation, is important not only for understanding the ecology of tropical forests, but also for forest management planning.

FS13.OC.05

Relationships between vegetation composition and soil fauna in different grasslands physiognomies in subtropical Brazil

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Decomposers affect vegetation performance by their density and diversity, changing productivity and community composition in grassland ecosystems. We intended to answer if the distinction between 3 grassland communities based on relief, hydromorphology and with differences in vegetation composition is reflected in structure and composition of soil fauna diversity and abundance.
We chose three grassland physiognomies: dry grassland, wet grassland and grassland with rock outcrops. On 3 granitic hills of Porto Alegre, RS, four plots of 1x1m were installed in each physiognomy. We used three sampling methods to collect organisms with different mobility: pitfall traps, soil and litter samples. We estimated abundance for 5 groups of soil fauna in each physiognomy and to answer the central question of relationship between vegetation and soil fauna a Mantel test. The pitfall traps showed more invertebrates on rock outcrops and dry grasslands, with more Acari in both grassland types, but more Collembola in the wet and rocky grasslands. A different pattern was found when using soil samples: Collembola were more abundant in dry and wet grasslands. For the others 3 groups, no significant difference in abundance was observed for any method and physiognomy. The Mantel test showed a significantly correlation between physiognomies and the invertebrates groups for all methodologies (Matrix correlation: 0.182, p: 0,003).This allows to conclude that are similar pattern of organization in both communities, probably interdependent. Higher invertebrate density at grasslands with rock outcrops seems to be caused by the greater heterogeneity of this physiognomy.

FS13.OC.06

Large mammals promotes diversity

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Large mammals have a key role in structuring plant communities. They act on trampling or herbivory. The loss of these animals can cause a series of changes in the trophic chain through top-down effects. In this study, we simulated the effects of local extinction of large mammals on the trampling of seedlings and on the beta diversity of seedlings in a tropical rainforest. We conducted this study at Ilha do Cardoso State Park where we built 15 plots fenced with wire mesh measuring 5 m x 3 m, which impeded access of large mammals, and 15 open plots. Each pair of plots was distant 200 meters from the next pair, and each plot was divided into quadrants of a square meter. We placed 30 artificial seedlings made of wire in three quadrants, totaling 90 seedlings per plot. In other three quadrants, we marked all the seedlings between 10 and 100 cm. Both experiments were followed every six months for 18 months. We used a GLMM to model the effect of each treatment and time on artificial seedlings. To test whether the variation in the community composition of natural seedlings differed between open and closed plots over time (beta diversity), we performed a permutation test for homogeneity of multivariate dispersions among the sample units – based on Jaccard and Bray-Curtis indexes. The trampling of artificial seedlings was significantly higher in the presence of large mammals ($P < 0.0001$) and along time ($P < 0.0001$). Excluding large mammals, the beta diversity of natural seedlings was significantly lower after 18 months for the Jaccard and Bray-Curtis index ($P = 0.01$ and $P = 0.009$). These results reinforce the idea that large herbivorous mammals are important modulators of plant diversity and act in trophic cascades. The maintenance of these animals in tropical forests is critical to its conservation.

FS13.OC.07

Effects of different legislation on the conservation status of *Amburana cearensis* in northwestern Argentina

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Amburana cearensis is an appreciated timber species, it is categorized as endangered on the IUCN red list, and it is distributed throughout the seasonal dry tropical forests of Brazil, Paraguay, Bolivia, Perú, and Argentina. In Argentina, *A. cearensis* is restricted to the provinces of Salta –where legislation establishes the minimum cutting diameter at 60 cm, and Jujuy –where logging is banned since 1972. Up to the present, there has been no effort to determine the effects of legislation on species conservation status on both provinces. We determined the species conservation status in both provinces by estimating species density using distance sampling methodology at 13 sites, and measuring DBH of each individual encountered. Considering data of both provinces together, we found a density of 1.12 individuals ha^{-1}. The density in Salta did not significantly differ from that found in Jujuy (i.e., 5.15 [95% Confidence Interval: 3.14; 8.45]; 3.67 [95% CI: 2.59; 5.17]), although in Salta most individuals (84%) were encountered in one of the sites. On the other hand, DBH was significantly lower in Salta than in Jujuy (23±12 vs. 41±18 cm; $p<0.05$). Differences observed in the characteristics of the species populations between provinces might be attributed to the application of different legislation. This is the first study that attempts to provide information to determine *A. cearensis* conservation status in Argentina. However, a global assessment of the species status is urgently needed. In the meantime, it seems convenient to halt logging in Salta, until information is gathered on the species biology and a subsequent sustainable management plan developed.

FS13.OC.08

Species loss in private lands of the Amazon basin

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The Brazilian Amazon, which gathers the major proportion of this tropical ecosystem, is at stake because of deforestation pressure due to land use change. Approximately 46% of its territory corresponds to private lands, which are supposed to achieve two objectives –biological preservation and agriculture production. By law, every farm must maintain 80% of its forest cover; however this is not always the case. In the estate of Rondônia, economic reasons have led to the conversion of over 50,000 km^2 of forest to agricultural lands during the last 22 years. Using Landsat images of the Rondônia state, we analysed 370 squares of 100 km^2 to understand the landscape changes. In 31 of those squares, we used prediction models to evaluate the biological consequences of deforestation. We collected data about presence of birds and mammals species gathered from 171 transects of 1 km and 216 interviews to local farmers. Our results demonstrate that as deforestation advances forest fragmentation increases and forest patches get smaller and more isolated. According to the prediction models, forest proportion is the most significant variable influencing species richness, particularly when forest cover is less than 60%. It means that the landscape contexts play an important role in the changes of species composition. These results make evident the fact that several species of birds and mammals are disappearing from >80% (37,500km^2) of the evaluated area. We recommend that at least 60% of forest cover should be kept in the landscape in order to maintain original richness of birds and mammals. However, neither this threshold (60% of forest) nor the one established by law (80%) are being achieved by the famers in the area.

FS13.OC.10

Effects of discontinuity of rivers (damming) on the structure of Oligochaeta (Annelida) assemblage of the Upper Paraná River

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We designed a field survey to test the hypothesis that the hydromorphological alterations caused by constructing Porto Primavera reservoir modify the structure of Oligochaeta assemblage along the Paraná River. For that, samples were collected in eight sampling stations along the Paraná River course, from the Porto Primavera reservoir to the mouth of Ivinhema River (about 100 km). In order to describe the Oligochaeta assemblage were used the attributes: species richness, density and composition. One-way ANOVA was applied to test differences among mean values of richness and density. Canonical correspondence analysis (CCA) was used to determine gradients and to select environmental variables that most influenced the composition of Oligochaeta assemblage. Our results revealed a reduction in species richness along the channel of the Paraná River, as well as an increase in Oligochaeta density, evidencing that the dam is really affecting the Oligochaeta assemblage. CCA discriminated the banks sites from the center sites on the axis 1, so that the bank sites had higher values of mud and Naididae species, mainly *Pristina* species. In center sites were recorded higher sand content (mainly medium sand) and high densities of *Narapa bonettoi*. Scores for the axis 2 separated the upper stretches (S1 to S4) from the lower ones (S5 to S8), due to the highest values of pebbles, granules, flow velocity, and Naididae species in the upper stretch, and the highest values of sand and *Narapa bonettoi* density in the lower stretch. The increase in density of *N. bonettoi* as increases the distance from the dam may be an indicative of recovery of hydromorphological conditions of the main channel, damaged by dam in the upper stretches, since this species is a good indicator of hydraulic conditions and healthy environments, and thus it may be considered a sentinel organism of the environments where it lives.

FS13.OC.11

Niche conservatism within woody vegetation domains in South America

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Niche conservatism is the retention of ecological traits over time, and may be seen as both a pattern and process with broad ecological relevance. Niche conservatism may have effects on species abilities to modify their ranges and, therefore, it is related to resilience and resistance of vegetation under climate changes. We investigated the extents of niche conservatism among domains with predominance of woody plant species in South America by the evaluation of their phylogenetic structure and the diversification of different taxonomic levels. First, we assembled a hypothetical relationship for the 8675 tree species from the eight vegetation domains sampled. Next, we tested for lineages over- or under-diversification at every domain and checked which domains had similar patterns by means of principal coordinates on the over- and under-diversification tables. The Amazon and the Coastal Atlantic domains had the highest species richness, and the Pampa, the lowest. Lineages over- and under-diversification followed a similar trend, although the Caatinga and the Chaco had more over-diversified lineages than, for instance, the Coastal Atlantic domain. Furthermore, the Amazon had the most divergent lineage diversification pattern, while domains sharing similar environmental conditions were more congruent in their patterns. These results suggest that an increase in species richness is not necessarily due to the addition of more lineages to a domain, but by the diversification of those able to colonize it. Overall, the phylogenetic structure of South America vegetation can be explained by niche conservatism, because lineage distribution seems to be related to environmental similarity among domains and because lineage diversification is likely linked to the ability to colonize them. Because niche conservatism is possibly widespread, we predict a low ability of vegetation to adapt to climate changes, leaving dispersal and tracking of suitable conditions as the main strategy for species cope with climate changes. (Fapesp)

FS13.OC.12

Fine-scale spatial patterns and pond morphology jointly affect metacommunity structure of Neotropical tadpoles

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There is a contentious debate about the scale at which spatial and environmental processes influence the variation in species composition (beta diversity) among sites. Much of this debate is related to the discussion about the role of neutral and niche processes in community ecology. Accordingly, there is no consensus if dispersal-limited organisms are strongly influenced by spatial dynamics at fine spatial scales. We analyzed the relative influence of pond morphology, water chemistry, and spatial variables on a tadpole metacommunity from southeastern Brazil. We asked the following questions: 1) What is the relative influence of water chemistry and pond morphology to the variation in species composition of tadpoles across ponds?; 2) Are fine-scale spatial processes influencing metacommunity structure of tadpoles? Since amphibians are noticeably dispersal-limited, we predict that spatial variables or the joint effect of space and environment will have a larger influence on species composition of tadpoles than environmental variables alone (water chemistry and pond morphology). We sampled tadpoles and environmental variables between August 2008 and January 2009 in 13 water bodies in the Serra da Bocaina National Park. We partitioned the variation in species composition among water chemistry, pond morphology, and spatial variables (PCNM axes) using partial RDA analysis in the R software. We found that spatial processes are important even at fine scale (~ 11 Km^2) and that pond morphology strongly affected metacommunity structure. Apparently, adult anurans reproductive behavior is driving metacommunity dynamics, since pond morphology have been shown to affect breeding site selection by adults, but not water chemistry. If local amphibian communities are restricted to habitat patches and have low dispersal abilities, the limited gene flow among communities may favor local extinction more often that previously thought. Our results present important implications for understanding amphibian species turnover in tropical environments.

FS14.P.01

SCIENTIFIC CLIMBING TRAINING IN FOREST CANOPY AND FORESTRY RESEARCH IN BRAZIL AND THE WORLD

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Studies of the canopies are remarkably recent and closely linked to the expansion of investigation about the tropics, but still to be limited when compared to other types of ecological studies developed in other forests levels. The reason behind this is related to security problems involved in canopy access (Mitchell 1986).
In this sense, based on a renowned worldwide knowledge, a pioneer training course of research in forest canopies, using a redundancy of safety and risk minimized was created in UFOP (Federal University of Ouro Preto).
The course combines theoretical aspects of the evolution of forest structure among the dicotyledons, forest biodiversity and structure of canopies with the most modern safety techniques in climbing and rescue procedures in the Field.
The course takes place in eight days, with practical learning during the day: about the equipment and applications, rescue techniques, rope climbing and how to moving in the canopy.
So far, the canopy course led to the conclusion to 3 doctorates, 11 masters and 2 graduations monographs, all focusing on aspects intrinsic to ecology of forest canopies. Were also published at least 12 papers directly related to the activities developed during the courses.
Finally, a major concern with the advancement of scientific research in forest canopies is the increased likelihood of accidents. Unlike other procedures for climbing, there are no international rules or certifications that determine the level of security and the minimum criteria for choosing and using equipment and techniques for research (which always deal with the inexperience of the researcher in the tree). However, it is a priority for the researcher to assume that responsibility to work with maximum security. Thus, the techniques adopted and published by the UFOP course promote a culture of caution and methodological discipline geared for maximum security in forest canopy research.
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S01.OC.01

Last millennia of the Tropical Moist Forest of Central Africa: forest or savanna?

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Long-term ecological records are essential to understanding past responses of vegetation to climate change and human activity. As part of a multi-disciplinary project (Coforchange), we undertook research into the past conditions that prevailed during the Holocene in a region that currently holds the world's second largest rainforest.

Tropical Moist Forest (TMF) extension in Central Africa has experienced dramatic changes over the last millennia (ex. ~3000 and 2000 years ago); disturbances which may possibly still influence today's repartition of forest and savannas, and species distributions. Are the light-demanding canopy plants in large TMF a recovery phase from past anthropogenic disturbances or from dry episodes? The project CoForChange helps shed new light in this region still too little studied with regard to climate, environmental and societal issues.

Lake, swamp and peat sediments or soils contain a variety of paleoenvironmental proxies to reconstruct local to continental climate histories. First we focused on modern surface soil and plants of Central Africa in order to assess the ecosystem responses in terms of carbon stable isotopes and Carbon/Nitrogen ranges and water use efficiency (WUE). These indicators are then applied on soil profiles and sedimentary cores to reconstruct spatial and temporal ecosystem perturbations, savanna corridors if any and WUE.

Our results demonstrated that carbon isotopic composition is a good proxy to assess the WUE and suggest that the C/N for tropics can be a potential indicator of the water table level of ecosystems. Using these new data added to those of former major projects (ECOFIT, PaleoFORGA, Regab) and to independent environmental tracers (pollen, charcoals, phytoliths…) this presentation will discuss the ecosystem resilience with respect to the disturbance and the two controversial hypothesis: human land- use intensification versus climatic impact on the Tropical Moist Forest 3000 years ago. Preliminary conclusions indicate that 3000 years ago the forest faced a dry event but there was large local variation with some areas demonstrating far greater resilience than others.

S01.OC.02

A multiproxy approach to study the impact of past fire regimes on tropical vegetation woody cover

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Anthropic fires are nowadays a primary factor of woody cover in African savannas. In the context of global climate change, the evolution of this strip of vegetation between forest and desert, where most of the population of the continent live, becomes crucial. The purpose of this study is to understand how past fire dynamic acted on woody cover and how it is recorded in natural archives to access long term ecology. To reach this goal we developed statistical models that permit to reconstruct quantitatively past woody cover using bio-proxies archived in lake sediments, and we studied their interactions with past fire regimes using charcoals records.

Bio-proxies were measured on three dated (^{210}Pb) lake sediment cores of Central African Republic covering the last two centuries. We calculated the ratios of (i) woody dicotyledons to Poaceae phytoliths (D/P); (ii) arboreal to non-arboreal pollen (AP/NAP) and (iii) ^{13}C abundance (ð^{13}C) in soil organic matter. These proxies were compared to remote sensing data (Normalized Difference Vegetation Index, NDVI) which represents an indirect assessment of the sub-actual woody vegetation cover. The sedimentary charcoal width/length ratio (W/L) was used as a proxy of burned fuel type and charcoal accumulation rates were computed.

Among the first results obtained, we characterized an abrupt decrease of the W/L ratio in one lake dated with the ^{210}Pb around 1995 and corroborated (i) by a decrease of the NDVI around the lake from 95% of forested pixels in 1994 to 35% in 1998 and (ii) by the decrease of the woody cover reconstructed from the three bio-proxies. For the lake in forest, an increase in charcoal influx is recorded during the past 30 years and is associated to a decrease in the woody cover.

These preliminary results are very promising and represent significant improvements in the understanding of how tropical bio-proxies are recorded. In the next step we will apply the bio-proxies relationships in palaeosequences covering the entire Holocene.

S01.OC.03

Human impact on the west central Africa rainforest during the last 3000 years

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Since the 90s in West Central Africa, several multidisciplinary scientific programs have improved our knowledge on palaeoenvironnements, revealing both remarkable changes during the Holocene and human adaptations to these changes. Evidences from palynologic and of geological data indicate that a fragmentation event of the forest massif occurred about 3000 years ago. The opening of the forest environment between 2500-1400 BP is concomitant of an increasing density of archeological sites confirmed by ^{14}C ages which show the installation of numerous populations 2000 years ago. These populations were metallurgists who had a strong impact on the forest by the establishment of hilltop villages, the development of slash-and-burn agriculture (pear millet, banana, colocasia, yams, oil palm) and the use of charcoal for the process of iron reduction.

Since 1400 BP an opposite dynamics settled down, with a stronger monsoon driving forest recolonisation and the progressive disappearance of human activities in the hinterland South-Cameroon / Gabon. At present two hypotheses are moved forward to explain this crash people in the hinterland;

1. Life and subsistence conditions changed dramatically, bringing people to leave the forest in order to find the more suitable opened landscapes.
2. These new climatic conditions generated an increase of diseases and\or of epidemics such as trypanosomiasis which affected people and urged them to leave the forest.

It is only in the XIth century that new populations of metallurgists re-occupy the abandoned forest space. We thus notice that this climate change strongly affected the forest ecosystems and that men always tried to bring answers adapted to these changes.

S01.OC.04

Land change in Colombia: a multi-scaled analysis between 2001 and 2010

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Monitoring land change at multiple spatial scales is essential to identify vulnerable areas of change and to guide biodiversity and habitats conservation policies. In Colombia, there is no consistent wall to wall multi-temporal dataset for land cover. Therefore, the purpose of this study is to assess land change from 2001 to 2010 in Colombia, focusing on three objectives: (1) determine how land change varies at four spatial scales: nation, biome, ecoregion, and municipality; (2) identify the spatial distribution of areas experiencing significant land change; and (3) discuss the implications of our findings for conservation planning in Colombia. We mapped annual land-use/land-cover (LULC) from 2001 to 2010 using MODIS (250 m) products with reference data from Google Earth (Quick Bird). Then, we performed a linear regression analysis for each municipality to assess land change in the 10-year period. The results revealed that at the national level there was a net gain of *woody vegetation* and *agriculture/herbaceous* classes which expanded mostly at the expense of the *mixed woody/plantations* class from the national to municipality scales. Analysis at the ecoregion level showed that the Montane forest ecoregions contributed substantially to *woody vegetation* regrowth, while the Llanos and Apure-Villavicencio ecoregions experienced the highest reduction in *woody vegetation*. These *woody* gains and losses were located primarily in several critical municipalities where dramatic LULC changes are occurring, driven by complex interaction between the globalization of markets, land abandonment, land uses policies, demand for wood products, and changes in technology. In addition, ecoregions with intense land conversion (e.g. Northern Andean Paramo) and ecoregions underrepresented in the protected area network (e.g. Llanos, Apure-Villavicencio Dry forest, and Magdalena-Uraba Moist forest) should be considered for new protected areas. Similarly, it is important to rethink conservation actions in some regions within the Northern Andean Montane Forest ecoregion where reforestation was observed.

S01.OC.05

Cenozoic imprints on the phylogenetic structure of palm species assemblages in the New and Old World

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Despite long-standing interest in the origin and maintenance of species diversity, little is known about historical drivers of species assemblage structure and composition in the New and the Old World. Here, we use global species distribution data, a dated genus-level phylogeny, and palaeo-reconstructions of biome distributions and climate to examine Cenozoic imprints on the phylogenetic structure of regional species assemblages of palms (Arecaceae), a species-rich monocotyledonous plant family characteristic of tropical ecosystems. Using the Net Relatedness Index (NRI), we quantify the degree of phylogenetic clustering and overdispersion of palm assemblages and measure to what extent species that co-occur in an assemblage are more (NRI > 0) or less (NRI < 0) closely related than expected by chance (i.e., compared to a null model). We find a strong historical imprint on the degree of phylogenetic clustering due to continental isolation and *in situ* diversification, especially in the Neotropics. Phylogenetic overdispersion emerged in biogeographic contact zones such as Colombia and around Wallace's Line. Differences in the degree of phylogenetic clustering among biogeographic realms are related to differential losses of tropical rainforests throughout the Cenozoic, but not to the cumulative area of tropical rainforest over geological time. A largely random phylogenetic assemblage structure in Africa coincides with severe losses of rainforest area, especially after the Miocene. Geologically more recent events also appear to influence phylogenetic structure in some regions: phylogenetic clustering increases with increasing intensity of Quaternary glacial-interglacial climatic oscillations in South America and to a lesser extent Africa, indicating that specific clades might be better able to survive in or recolonize climatically unstable regions. Our results suggest that changing geomorphology, climate, and vegetation throughout the Cenozoic have had strong impacts on the evolution and present-day phylogenetic structure of regional species assemblages in the Old and New World tropics.

S01.OC.06

Predicting biome distribution responses to climate change: Implications of savanna and forest as alternative stable states

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Recent work examining the global distribution of the savanna and forest biomes suggest that an interaction between rainfall and fire is pivotal in making savanna a stable and distinct alternative to forest. Climate influences tree cover globally but, at intermediate rainfall (1000 to 2500 millimeters) with mild seasonality (less than 7 months), tree cover is bimodal, and only fire differentiates between savanna and forest.

Large areas of Amazonia and the Congo are currently forest, but may potentially be at risk for transition to more open ecosystems. Similarly, much of the tropical distribution of savanna is maintained by fire, and may be susceptible to changes to more closed biome configurations. Here, we present (a) results examining temporal patterns of biome distribution change over the past 10 years from an analysis of MODIS VCF, and (b) results examining potential future biome responses to climate change, based on estimations of ecological distance from thresholds and projected future changes in climate.

S01.OC.07

TROPICAL FOREST TYPE EFFECTS AQUATIC ECOSYSTEM STRUCTURE AND FUNCTION IN BORNEO

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The rainforests of the Borneo region are the oldest in the world - some have been continually forested for 130-140 million years - and are exceptionally diverse. We compared ecosystem function (leaf litter decomposition, a fundamental process) and structure (fauna associated with leaf litter) of headwater streams flowing through lowland and hill dipterocarp forests, alluvial forest, limestone forest, heath forest, montane cloudforest and also peatswamp forest pools. The forests varied in age (several thousand – e.g. peatswamp forests – to millions of years – e.g. dipterocarp forests), altitude (20-3300 masl), tree diversity (<10 to >50 riparian species), and substrate (e.g. clay, alluvium, peat) resulting in variations in stream temperature (7-26°C), water chemistry (pH 3.3-7.1) and leaf litter inputs. Leaf litter varied in diversity. Peatswamp and heath forest leaves had higher levels of toughness, lignin and secondary compounds (e.g. phenolics). Riparian litter supports aquatic productivity of most forested headwater streams and different forest types result in dissimilarities in aquatic ecosystem function and structure. Contrary to many previous tropical stream studies where microbial decomposition dominated ecosystem functioning, invertebrate shredders were important in processing leaf litter in dipterocarp forests, limestone forests and cloud forests. However shredders were absent from peatswamp forests and scarce in heath forest streams and leaf decomposition was negligible. Shredders in dipterocarp forest streams tended to be large (e.g. 7cm aquatic cockroaches), possibly an adaptation to eating a wide variety of tough, toxic leaves, and leaves break down quickly due to microbial and invertebrate action. Cooler, higher altitude sites supported higher abundance and diversity of smaller shredders than lowland sites and they were dominated by taxa similar to those observed in temperate forested streams. Climate warming is expected to alter forest distribution (e.g. eliminate high altitude cloudforests), eradicate highland taxa, elicit changes in tree phytochemistry, and alter ecosystem functioning in all forest types.

S01.OC.08

Reaching the forest canopy: towards mechanistic models for vascular epiphyte dynamics

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Vascular epiphytes are a conspicuous and important, yet often neglected, component of the tropical and subtropical flora, contributing approximately 10% to global vascular plant species richness. Abundance, diversity, and community structure of vascular epiphytes vary widely across spatial scales. However, the underlying mechanisms are not fully understood. In order to provide a theoretical background that allows to analyze the mechanisms, to test hypotheses and to make predictions in the context of environmental change, we developed a detailed individual-based model. Our model considers the three dimensional distribution of the phorophyte surface, i.e. the epiphytic substrate, and of the microclimatic factors within the forest. We implemented key ecological processes like pollination, dispersal, and mortality and simulated different functional types of epiphytes based on their ecological and physiological properties (e.g. water use efficiency, dispersal kernel or rate of photosynthesis). To validate our model we used high quality spatial and temporal data of epiphytes collected in Panama and Ecuador. The simulations revealed complex effects of climate and disturbance regimes on the epiphyte community, particularly water availability and stability of the forest system were of importance. We were able to identify functional types of epiphytes that were particularly susceptible and thus vulnerable to disturbances like fragmentation and increased drought stress. Our model was constructed as a flexible tool so that additional methods or new findings can be easily integrated. Hence, it can be adapted to various real-world situations and could be used to evaluate potential impacts of natural or anthropogenic changes of environmental conditions. Although largely neglected by ecological modelling and theory so far, our mechanistic approach brings vascular epiphytes onto the modelling agenda and opens up new avenues for further investigation.

S01.OC.09

Tropical forest carbon balance in a warmer world: a critical review spanning microbial- to ecosystem-scale processes

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Tropical forests play a major role in regulating global carbon (C) fluxes and stocks, and small changes to C cycling in this productive biome could dramatically affect atmospheric carbon dioxide (CO_2) concentrations. Temperature is expected to increase over all land surfaces in the future, yet we have a surprisingly poor understanding of how tropical forests will respond to this significant change. Here we present a contemporary synthesis of the existing data and what they suggest about how tropical forests will respond to increasing temperatures. Our goals were to: (1) determine whether there is enough evidence to support the conclusion that increased temperature will affect tropical forest C balance; (2) if there is sufficient evidence, determine what direction this effect will take; and, (3) establish what steps should to be taken to resolve the uncertainties surrounding tropical forest responses to increasing temperatures. We approach these questions from a mass-balance perspective and therefore focus primarily on the effects of temperature on inputs and outputs of C, spanning microbial- to ecosystem-scale responses. We found that, while there is the strong potential for temperature to affect processes related to C cycling and storage in tropical forests, a notable lack of data combined with the physical, biological and chemical diversity of the forests themselves make it difficult to resolve this issue with certainty. We suggest a variety of experimental approaches that could help elucidate how tropical forests will respond to warming, including large-scale *in situ* manipulation experiments, longer term field experiments, the incorporation of a range of scales in the investigation of warming effects (both spatial and temporal), as well as the inclusion of a diversity of tropical forest sites. Finally, we highlight areas of tropical forest research where notably few data are available, including temperature effects on: nutrient cycling, heterotrophic *versus* autotrophic respiration, thermal acclimation *versus* substrate limitation of plant and microbial communities, below-ground C allocation, species composition (plant and microbial), and the hydraulic architecture of roots. Whether or not tropical forests will become a source or a sink of C in a warmer world remains highly uncertain. Given the importance of these ecosystems to the global C budget, resolving this uncertainty is a primary research priority.

S01.OC.10

Soil physical and chemical characteristics affect the structure and composition of secondary forests on Amazonian anthropogenic soils

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Terra Preta (TP) are anthropogenic soils created by pre-Columbian Amazonian populations hundreds to thousands of years ago. The activities of those populations resulted in profound and long-lasting modifications in these soils, as well as in the vegetation associated with them. Today, many of these sites are inhabited and used and managed in different ways by local populations. We investigated how structural and floristic parameters of secondary forests originated from shifting cultivation are affected by a gradient of soil physical and chemical characteristics from TP to adjacent soils. In 52 250m^2 plots on secondary forests, ages ranging from 5 to 30 years old, along the middle Madeira River, Amazonas, Brazil, we sampled all trees ≥10cm in diameter and all palms ≥1m in height. We also collected soil samples for physical and chemical analyses. Soil data were summarized using Principal Component Analysis, and the derived axes were used together with stand age as predictors in multiple regressions, using structural and floristic parameters as dependent variables. The floristic composition of trees (R^2 = 0.62) and palms (R^2 = 0.58) was affected by both soil fertility and texture, but not by stand age. In contrast, structural and diversity variables were explained by stand age and soil fertility, which negatively affected total species richness (R^2 = 0.35), tree species richness (R^2 = 0.39) and tree density (R^2 = 0.16), but not by soil texture. Human management certainly contributed to floristic differences across the soil fertility gradient, since more fertile soils (TP) are also more intensively managed. Soil modifications caused by pre-Columbian populations, coupled with present strategies of resource use and management can strongly influence successional trajectories on TP and result in secondary forests with specific structural and floristic patterns. These environments aggregate heterogeneity to Amazonian landscapes and should be considered in conservation efforts.

S01.OC.11

Comparative chloroplast DNA phylogeography of four tree species in western Amazonia

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Many hypotheses have been proposed for understanding how the Amazon rainforest has developed and changed over long time scales, but they have not been tested using a comparative phylogeographic approach. Here we assess genetic patterns in four tree species (*Clarisia biflora*, *Poulsenia armata*, *Otoba parvifolia*, and *Jacaratia digitata*) widely distributed in western Amazonia. A total of 493 individuals were collected in 30 populations from Ecuador, Peru and Bolivia and successfully sequenced for the chloroplast *trnH-psbA* region. All species show some genetic variability among populations and distinct (private) haplotypes are present across western Amazonia. High geographic genetic structure was found in all species ($Phi_{ST} > 0.90$, $N_{ST} > G_{ST}$) possibly related to limitation by seed dispersal (Mantel test, $r = 0.17 - 0.49$). The frequency of pairwise nucleotide differences among haplotypes (mismatch distribution) indicates a history of population expansion in *Clarisia biflora* and *Otoba parvifolia*. In contrast, there are older stable populations in *Jacaratia digitata* and *Poulsenia armata*. At regional scale, all species show areas of recent colonization possibly related to post Pleistocene climatic changes. High haplotype and nucleotide diversity ($h \geq 0.5$ and $p \geq 0.007$) in all species in north-western and south-western Amazonia suggests that rain forest has occupied these regions over timescales of millions of years. The signature of concordant genetic breaks can be related to geological changes and arches in western Amazonia. We conclude that western Amazonian species have accumulated some genetic variability but the observed genetic patterns are complex and cannot be explained by one single mechanism.

S01.OC.12

Management, Drought, and Fire Interact to Pre-Adapt an Eastern Bolivian Forest to Disturbance

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Logging, drought, and fire are considered to be among the largest threats facing Amazonian forests. While interactions between two of these three threats have been investigated, interactions between all three have yet to be reported. We hypothesized that logging pre-adapts forests to drought by selecting for drought-tolerant species in gaps and skid trails; that drought most severely affects trees with exposed crowns; that fires kill mostly small trees and those with thin bark; and, that the interaction of these three factors pushes forests towards a smaller-statured and lower basal-area forest that is drought- and fire-tolerant. To address these hypotheses, we complemented a 12-year biennially-censused silvicultural experimental plots that were partially burned in 2004 with a seedling drought-tolerance experiment, bark-thickness measurements, and measurements of seedling survival during the most severe drought in at least 50 years. We find that drought-tolerant seedlings have only slightly higher survival rates than drought-intolerants as climatological water deficit increases, but drought-tolerants survive substantially better than drought-intolerant seedlings in logging gaps and skid-trails, thereby pre-adapting the community of tree species to future droughts. We confirm previous findings that emergent and dominant adult trees suffer more than from drought than co-dominant and sub-canopy trees, and that fire kills mostly small and thin barked trees. Combined, drought and fire tend to reduce forest stature. Overall, we confirmed that logging, drought, and fire pushed this forest towards one that, while reduced in height and basal area, is better adapted to future disturbances.

S01.P.01

Intercontinental spatiotemporal variations in tropical tree mortality regimes

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The terrestrial biosphere, especially in the Neotropics, currently functions as a large carbon sink, albeit highly variable. Some future models suggest it will change to a source later this century, based on a balance between growth (carbon gains) and mortality (carbon losses). Growth is relatively well understood and modelled, but for mortality a constant rate of 2% per year is generally assumed, irrespective of e.g. tree species, age, location or time.

The objective of this study is thus to identify and quantify spatiotemporal variations in tree mortality across vegetation types and environmental gradients in order to improve DGVM predictions. Tree mortality rates have been derived from tree censuses as recorded for the permanent sample plots of the pan-tropical Forest Plots Database[1]. Mortality rate distributions and variations therein have been inferred using hierarchical Bayesian analyses for four different regions.

Significant region-to-region differences in mean mortality rates, and spatial and temporal variance in mortality, have been identified. On a continental scale, mean mortality is lowest in Australia, though the greatest spatiotemporal variance is observed in the Neotropics. The results imply that models of tropical carbon dynamics, and inventory schemes designed to estimate the source/sink status of forests, need to consider spatiotemporal variation in tree mortality, and how it differs among these regions.

[1] Lopez-Gonzalez, G. et al. (2010) Forest Plots Database. http://www.forestplots.net/

S01.P.02

SPECIES SPECTRAL SIGNATURE: A NEW TOOL FOR DISCRIMINANTING SPECIES IN AMAZON FOREST

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The combined use of high technology instruments and appropriate techniques for discriminating tree species is necessary to improve the biodiversity inventory system in tropical countries. The Species Spectral Signature (SSS) appears to be a promising tool to improve tree species discrimination. In this study, we demonstrate an outstanding performance using SSS on close related species of the *Eschweilera* and *Corythophora* genus, Lecythidaceae family, with database constructed using dry whole leaves collected since 1979, and identified by a single specialist. With thirty-six spectral readings to represent each specimen, we obtained 99.4% correct species discrimination. When only one spectral reading in any part of one leaf was used, the correct discrimination rate was 97.1 %. The SSS provided better results than DNA barcoding in tropical forests and is a quick, economical and non-destructive sampling technique. Based on the results presented, we believe that it is possible to construct SSS databases for herbarium samples that were collected and identified by specialists, even if these samples only consist of vegetative material. SSS databases can improve the recognition of the forest inventory of vegetative samples and unify the identification process of tropical tree species.

S01.P.03

The carbon balance of a rubber plantation in tropical China

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Regrowth of tropical secondary forest and plantations cannot offset carbon release caused by tropical deforestation and subsequently lead net carbon losses in tropical land. Nevertheless, large uncertainties existed in this estimation. We use an innovated biometric method to estimate net dry matter production and net ecosystem production in a rubber forest which is the most widely spread plantations in tropical Southeast Asia. The biometric-based results were set as a background value and used to track a best data procedure for eddy flux in the studied ecosystem. Ecosystem was a moderate carbon sink (NEP= 287 gC m-2 yr-1) according to biometric estimate during the investigate interval. The eddy covariance based annual sum carbon budget is largely dependent on data processing: a large carbon sink (NEE= -904 gC m-2 yr-1) after Reichstein u* filtering and gap filling versus slight net carbon source (NEE=4 gC m-2 yr-1) processed by ChinaFLUX procedure. Nighttime ecosystem carbon flux does increasing linearly at low level and saturate at high level of u* as previous assumptions. Nevertheless, it is not the same case for annual sum of NEE estimated from limited available dataset. As micrometeorological theory was most reliable under neutral conditions, we pick the neutral condition dataset out and filled the non-neutral condition data with neutral condition based environmental response equations and obtain a neutral condition based NEE of -267 gC m-2 yr-1 which is the most close value to biometric estimates. Thus, we would like to recommend the neutral condition method could be used in tropical forest eddy flux data processing. This study did not support that plantation as large carbon sinks. A carbon balance pattern was also established for convenient of further studies.

S01.P.04

FOSSIL AND MODERN POLLEN FROM MADEIRA RIVER BASIN IN THE AREA OF INFLUENCE OF THE AHE JIRAU, RONDONIA STATE - BRAZIL

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During the last decade several hydroeletric projects have been carried out along the Brazilian rivers. An example is the Madeira River located in Rondonia State, Eastern Amazonia where the Jirau Hydroelectric Plant (AHE) is being installed. A group of researchers throughout the Paleontological Monitoring and Saving Program has been accompanying the work of excavations, allowing recognizing the past and present pollen assemblages of selected sediments outcrops, in order to understand vegetational and climate changes from this present-day forested region. Until now, few paleoecological studies supply insight into the vegetation history of Amazonian ecosystems, and in the Rondonia State they are rarer due the dense rainforest cover that difficult the access to region. Thus, sediments sampled from an exhumed 95 cm-thick organic clay layer provided the first palynological information for this region. Two AMS 14C dates reveal an interval of age between 41350 and 43500 +/- 290 cal. years BP that correspond to Late Pleistocene period. The pollen assemblages for this period are dominated by forest taxa like Euphorbiaceae (mainly *Alchornea*), Fabaceae, Bombacaceae, Malpighiaceae and Sapindaceae. Spores of Pterydophyta are abundant and together with Onagraceae pollen mark a clear evidence of a wet forest. No significative vegetational changes could be noticed along this layer, probably representing a Madeira River flood plain that once abandoned was covered by soils. When these fossil data are compared to modern pollen rain assemblages, the principal differences are reflected by reduced number of spores of Pteridophyta and the marked presence of Arecaceae types in the surface soils samples taken around the studied local. Euphorbiaceae and Fabaceae continue to be the most important families represented in the modern pollen data. These are preliminary data, and other outcrops are also being studied that will permit a more detailed reconstruction of the vegetation from the Madeira River basin.

S01.P.05

Spatial heterogeneity of soil respiration in a 20-ha tropical rainforest plot

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Abstract

Soil respiration is an important ecosystem process as indicated by numerous published studies (376,000 results come out searching by Google Scholar with keywords of soil respiration). Observations on temporal variation of forest soil respiration in one or several fixed points are not lack. Nevertheless, we know less about how soils respiration behaves in the space and studies done so far suggest that the spatial distribution of soil metabolic activity is the result of the interaction of very different abiotic-biotic factors that furthermore, change with time. We conducted large scale intensive soil respiration measurements in a 20-ha tropical rainforest plot. The results showed that:

1. The frequency distribution of soil respiration at spatial scale is not normal. Termite activity is not the reason of respiration “hot-spots”.
2. Spatial heterogeneity is higher in soil respiration than which in soil moisture or temperature as indicate by high fractal dimension values derived from semivariance analysis.
3. There is no close relationship between soil respiration during the rainy season and which in the dry season. It indicates that spatial pattern of respiration change with time.
4. Neither soil temperature nor moisture can well explain the spatial variance of soil respiration. Soil respiration even negatively correlated to soil moisture during the dry which out of our expectation.

Keywords: termite activity, semivariance, soil respiration hot-spots

S01.P.06

Vegetation, biodiversity, fire and climate dynamics in tropical and subtropical South American ecosystems during the late Quaternary

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Palaeoecological background information is needed for management and conservation of the highly diverse tropical ecosystems. Questions on the development of ecosystems, its biodiversity, dynamic and stability, its response to environmental change such as climate, and the role of human impact in particular fire, are essential. Further questions on its natural stage of vegetation or its alteration by pre- and post-Columbian anthropogenic activity are also important. To answer these questions, palaeoecological and palaeoenvironmental data based on pollen, charcoal, and multivariate data analysis of radiocarbon dated sedimentary archives from different ecosystems such as Amazon lowland rainforests, mountain rain forests, Atlantic rain forests, savanna´s and Araucaria forests are used to provide an insight into past vegetation changes that allow us to improve our understanding of the modern vegetation and to develop conservation and management strategies for the strongly affected ecosystems.

S01.P.07

BIODIVERSITY PARTITIONING OF TROPICAL ANT COMMUNITIES: COMPARING SAVANNA AND RAINFOREST IN BRAZIL AND INDONESIA

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Few studies focus on similarities in community structure among common habitat types across the world. We analyzed ant communities from savanna and rainforests in two tropical countries: Brazil and Indonesia. We hypothesized that tropical ant communities, in similar habitat types, show similar diversity partitioning patterns across spatial scales. In each country, for each habitat type we selected three landscapes (landscape scale), in which we sampled the ants in four sites (site scale) along ten sampling units (local scale) per site. We applied the additive partitioning of biodiversity approach to quantify the contribution of alpha at local scale and beta-diversity across spatial scales to the gamma-diversity of each habitat type. In all ant communities of all habitats in both countries, α-diversity at local scale and β-diversity among landscapes were higher than expected by null models, whereas β-diversities among sampling units (local scale) and among sites were lower than expected by chance. These patterns appeared to be due to high dispersal of ants at small to intermediate scales, causing high species diversity at local communities and a constant species flux among them. However, at large scales, historical processes could have been responsible restricting the species flux between landscapes. Theoretical studies have pointed out the dispersal ability of ant species as an alternative mechanism to explain the high ant diversity in tropical communities rather than niche partitioning. We credit the similarities on ant diversity patterns among all habitats to a common ant species dispersion pattern, which allow species override inter-specific competition restrictions at small to intermediate scales, but this species movement is cut off in a similar way at large scale by expressive physical restrictions, for example geographical barriers. Therefore, our data support theoretical assumptions that species dispersion movements play an important role for ant species coexistence and richness in tropical ant communities.

S01.P.08

PALYNOLOGICAL STUDY OF HOLOCENE SEDIMENTS FROM BANANAL ISLAND, TOCANTINS STATE – BRAZIL

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The Bananal Island included in the context of the Araguaia River Basin (western portion of Tocantins State) is considered the largest fluvial island in the world. This area is currently a tropical plain, seasonally flooded by rainfall and water table saturation, covered by savanna-forest mosaic whose dynamic is still unknown. Therefore, the aim of the present study is to investigate the natural history of the vegetation and evaluate the environmental impacts in these wetland ecosystems. Thus, a sediments core was taken from a small lake located inside the Bananal Island using a Russian trade, and submitted to palynological analysis according to usual techniques including acetolyse. The core lithology consists of brown fine sand (100 – 81 cm depth) and grey sandy clay (81-0 cm depth) being rich in leaves and roots at the top (20-0 cm depth). The AMS ^{14}C dates indicate an age around 920 +/- 30 cal years BP. The pollen assemblages are dominated by Myrtaceae, *Cecropia*, *Alchornea*, Fabaceae, Moraceae/Urticaceae, Rubiaceae, Melastomataceae/Combretaceae and *Protium* types. A total of 49 distinct pollen types belonging to 21 families are represented in the pollen signal. Spores of Pteridophyta are abundant along the core. The core base corresponding to initial sediments deposition is marked by great amount of Poaceae and Cyperaceae pollen, decreasing towards the top. By the other hand, the forest taxa especially Myrtaceae, *Cecropia* and *Alchornea* increase significantly indicating a young forest successional stage. Despite the river floodplain character of this area, receiving pollen grains brought by rivers, the recognized pollen types reflect the local vegetation since Myrtaceae, Fabaceae and Rubiaceae are dominant families as observed during the fieldwork. *Cecropia*, *Alchornea* and Moraceae/Urticaceae pollen were probably transported by wind to lake sediments. In order to improve the knowledge about the past vegetational changes, other lakes from Bananal Island are being studied.

S01.P.09

History of paleofires associated with past human disturbances in the lowland semi-deciduous forests of Central Africa.

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The origins of the patchwork of lowland semi-deciduous forests were apprehended in Central Africa. Understanding past forest dynamics is a major component to predict the effects of both present climate change and human activities.

In this multidisciplinary approach floristic inventories are considered in association with an anthraco-archaeological study of the soils. It was carried out in the Northern Republic of Congo and Southeastern Cameroon through the ERA-net BiodivERsA CoForChange project.

Soils of open canopy vegetation types contain charcoals, charred oil palm (*Elaeis guineensis*) nuts and archaeological artifacts such as ceramics and metallurgical slags more abundantly than those of dense forests. Twenty-two radiocarbon datings were performed in the major disturbed layers. Most of these datings (45%) are comprised between 2,262 and 1,403 *cal.* years BP. This period of intense disturbances encompasses the entire semi-deciduous area. The 678 to 302 *cal.* years BP period represents another important grouping of dates (27%). These two disturbance peaks are associated with artifacts.

The current dense forests seem to have been less disturbed in the past. The first period of disturbance is in continuation with the last major arid phase around 2,500 years BP and might be linked to major movements of Bantou populations. The second might be linked to a dry phase, contemporaneous with the Little Ice Age.

S01.P.10

Pericopsis elata (Harms) Meeuwen in Cameroon: Ecological Check-up of an Endangered Timber Species

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Pericopsis elata (Fabaceae – assamela, afrormosia, kokrodua) is a high valued timber species of the moist semi-deciduous African forests. Because of logging which started more than 50 years ago, it is considered as threatened and included on both IUCN Red List and CITES Appendix II. Nevertheless, there is still little information available on the species ecology: essential biological parameters controlling its population dynamics remain unknown.

Our study first aims at improving the knowledge of its main ecological parameters, then at assessing the impact of selective logging on its populations in a forest management unit in Cameroon (*ca* 120,000 ha). After inventorying the species (sampling rate of 1.2%), mortality and growth were assessed over continuous 5- and 2-year periods in unlogged and logged areas, respectively. Phenology was monitored in the unlogged forest during 5 years (leaf shedding and flushing, flowering, ripe and unripe fruiting).

The population structure followed a bell-shaped curve. Mean annual diameter increments in both environments did not differ significantly between unlogged and logged areas (0.29±0.06 0.31±0.04 cm for unlogged and logged areas, respectively). *P. elata* is a deciduous species that flowers at the end of the main dry season (Marsh-April). The minimum reproduction and effective flowering diameters were, respectively, 32 and 37 cm. Fruit maturation took place during 7 months (the seed rain occurs in December-January), but all unripe fruits abort 3 years out of 5.

With a minimum logging diameter of 90 cm, the recovery rate computed over a 30-year period was greater than 100%. Selective logging harvested only 12.1% of the total number of seed trees and had little influence on the species biological parameters. Securing sufficient regeneration as a post-logging action is probably the most important consideration for achieving long-term sustainability.

S01.P.11

MULTI-SCALES FACTORS EFFECTS IN ANT DIVERSITY

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One of the major concerns in community ecology studies is the partitioning between the effects of factors acting at the studied scale and those operating at broad spatial scales in the species diversity. We verified in which spatial scales these factors act, at the sampling data scale or at the immediately larger scale. We also investigate if there is a dependence of the factors effects regarding ant habitat type (forest and savanna) and microhabitat type (arboreal, epigaic and hypogaeic ants). The forest and savanna habitats were located in Atlantic rainforest and *Cerrado* (Brazilian savanna) biomes in Brazil. To each habitat, we selected three landscapes (landscape scale) in which ants were sampled in four sites (mesoscale) along ten sampling units (local scale). We collected data that were used as surrogates of resources amount and heterogeneity and conditions. We performed model selection in which global models accounted for the influence of resource and conditions surrogates, acting as factors at the sampling scale and at the immediately larger scale, in ant diversity at local scale and mesoscale. Local factors and meso-factors played a similar relative influence on the ant diversity at local scale. At mesoscale, the parameters evaluated seem to loss their influence in the ant species diversity. However, the ant species diversity of both spatial scales seems to be under the influence of different factors that could act at distinct spatial scales according to the habitat type and microhabitat. Therefore, we consider that studies about ant community structure should account for the idiosyncratic roles of factors associated to the ant habitat types and microhabitats.

S01.P.12

Factors driving altitudinal richness gradients of plant species in tropical mountains

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Altitudinal patterns of species richness comprehend the ecological patterns most evident in nature and therefore also studied. Until now, the bulk of studies investigating the factors driving altitudinal gradients were restricted to analyses of field data. The factors most commonly suggested influencing altitudinal patterns are geometrical constraints (edge and mid-domain effects), distribution of environmental factors (e.g. humidity or pristine habitat) or a combination of both. However, other factors may play a role, such as metabolic constraints. Here, we took advantage of the development of computer power and of new mechanistic tools, to investigate altitudinal gradients of tropical plant richness. Species richness emerged from a multi-species simulation model that integrates demography, interspecific resource competition, and metabolic trade-offs. Stage-structured populations of species with different traits and habitat requirements competed for space in hypothetical mountain slopes. Through a full-factorial experimental design with contrasting scenarios, we investigated the effects on richness gradients of area, metabolic constraints, competitive pressure (total number of species), distribution of suitable habitat (determined by temperature and species habitat requirements), and the interaction among all these factors. For this task, we compared simulation results with mid-domain-based null models of richness gradients. The altitudinal gradients of plant species showed complex patterns. In general, decreasing area and increasing both species richness and niche breadth increased the deviance of the simulated patterns from the mid-domain null predictions, generally towards colder temperatures (highlands). This was because colder regions can harbour more individuals due to lower metabolic rates, and, therefore, higher carrying capacities and alleviated competition pressure. Competition shifted more strongly simulated richness also even when metabolic rates were set not to vary with temperature. Although rarely taken into account when analysing field data, our simulation results indicate that competition pressure and metabolic constraints are underpinning forces generating richness gradients.

S02.OC.01

Slowly but surely, paleoecologists and phylogeographers integrate fossil, climate, and genetic data to understand diversity in the Atlantic forest hotspot.

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We aim at a trans-disciplinary synthesis of the bioclimatic history of the Brazilian Atlantic rainforest by integrating analyses of current forest climate, phylogeographic data, a new generation of paleoclimatic models, and novel fossil pollen data that speak of climatic changes during the last 25,000 years. There is strong evidence of changes in South American Summer Monsoon (SASM) activity at millennial and orbital scales, suggesting that an anti-phasing pattern of precipitation of the Monsoon activity induced asynchronous patterns of forest movement between northern and southern Atlantic forests. This re-organization of the air circulation triggered successive changes in the floristic composition of the forest, likely affecting forest animals and plants. Here, we explore whether the available genetic data from local species support such see-saw pattern. We also explore ways to improve existing paleomodels of forest distribution based on interpolated data from weather stations and general circulation models that account for the heterogeneity in climatic spaces occupied by the forest. When analyzed jointly, these new environmental analyses and molecular data from amphibians and reptiles point to the central role of species' physiological constrains in shaping biological responses to Late Quaternary climate change.

S02.OC.02

Last Glacial and Holocene Atlantic and Amazon Rainforest Dynamics

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Paleoecological records from the montane Atlantic and Amazon Rainforest are essential to the understanding of vegetation changes since the last glacial cycle. Carbon isotope and pollen records were analyzed from peat and soil samples to access the impact of the glaciation on the native vegetation of the Serra do Mar Rainforest in São Paulo, southeastern Brazil. From ~31,000 to ~25,000 cal yr BP, a subtropical forest with conifer trees is indicative of cool and humid conditions. In agreement, carbon isotopic data on soil organic matter (SOM) suggest the presence of C3 plants and perhaps C4 plants from ~31,000 to ~22,000 cal yr BP. The significant increase in the sedimentation rate and algal spores from ~22,000 to ~21,000 cal yr BP indicates increasing humidity, associated to an erosion process between ~21,000 and ~17,500 cal yr BP. From ~17,500 cal yr BP to present there is a substantial increase in arboreal elements and herbs, indicating more humid and warmer climate. From ~21,000 to ~1000 cal yr BP, $\delta^{13}C$ values indicated the predominance of C3 plants. Carbon isotopes of SOM were used to evaluate the paleodynamics of the 200-km transect forest-savanna ecotone on the border of Amazonas and Rondônia States, southern Brazilian Amazon. $\delta^{13}C$ values obtained from soil profiles in the savanna (-27 to -14‰) and forest regions (-26 to -19‰), reflected changes distribution of C3 (trees) and C4 plants (grasses) in response to climate changes. These results indicate that from ~ 19,000 to ~10,000 cal yr BP, the study area was covered by forest vegetation. Between ~10,000 and 3000 cal yr BP and to present, savanna and forest expanded, respectively. The study suggests that extensive forested areas existed in the Amazon during the LGM and that savanna vegetation expanded during the early to mid Holocene, in response to warm and dry conditions.

S02.OC.03

Climatic stability in the Brazilian Cerrado: implications for biogeographical connections of South American savannas, species richness and conservation in a biodiversity hotspot

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We investigate the historical distribution of Cerrado across Quaternary climatic fluctuations and generate historical stability maps to test: (1) whether the 'historical climate' stability hypothesis explains squamate reptile richness in the Cerrado; and (2) the hypothesis of Pleistocene connections between savannas located north and south of Amazonia. We generated occurrence datasets from 1000 presence points randomly selected from the entire distribution of the Cerrado, as determined by two spatial definitions. We modelled the potential Cerrado distribution by implementing a maximum entropy machine-learning algorithm across four time projections: current, mid-Holocene (6 ka), Last Glacial Maximum (LGM, 21 ka), and Last Interglacial (LIG, 120 ka). We generated historical stability maps (refugial areas) by overlapping presence/absence projections of all scenarios, and checked consistencies with qualitative comparisons with available fossil pollen records. We built a spatially explicit simultaneous autoregressive model to explore the relationship between current climate, climatic stability and squamate species richness. Models predicted the LGM and LIG as the periods of narrowest and widest Cerrado distribution, respectively, and were largely corroborated by palynological evidence. We found evidence for two savanna corridors (eastern coastal during the LIG and Andean during the LGM), and predicted a large refugial area in the north-eastern Cerrado (Serra Geral de Goiás Refugium). Variables related to climatic stability predicted squamate richness better than present climatic variables. Our results indicate that Bolivian savannas should be included within the Cerrado range and that the Cerrado's biogeographical counterparts are not Chaco and Caatinga, but the disjunct savannas of the Guyana shield plateaus. Climatic stability is a better predictor of Cerrado squamate richness than present climate. Our stability maps can be used in future studies to test diversity patterns and genetic signatures of different taxonomic groups, and as a higher-order landscape biodiversity surrogate for conservation planning.

S02.OC.04

Connections between the Atlantic and the Amazonian forest avifaunas represent distinct historical events

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Many bits of evidence support past contacts between the Atlantic and the Amazon forests through the South American dry vegetation diagonal, but the spatiotemporal dynamics of this contact still needs to be investigated to allow a better understanding of its biogeographic implication for birds. Here we combined phylogenetic data using a supermatrix approach with distributional data to depict the historical connection dynamics between these biomes for New World Suboscines. We examined the variation in divergence time and then compared spatial distributions of taxon pairs representing old and recent divergences. Our results pointed for two distinct spatiotemporal pathways connecting the Atlantic and the Amazonian forests in the past: (1) old connections (middle to late Miocene) through the current southern Cerrado and Mato Grosso and the transition towards the Chaco and palm savannas of Bolivia and Paraguay; (2) young connections (Pliocene to Pleistocene) possibly through the Cerrado and Caatinga in northeastern Brazil. In addition, the overall species richness maps for old and young splits showed a disparity in the AF taxa distribution between them. Interestingly, nearly all AF species that originated from old splits occur in central and southern AF, whereas taxa that originated from recent splits occur predominantly in northern AF. We suggest that the main events that played important roles in these connections were: geotectonic events during the late Tertiary associated with the Andes' uplift (old connections), and Quaternary climate changes that promoted the expansion of gallery forest through the Cerrado and Caatinga in northeastern Brazil (young connections). Our results are the first general approximation regarding both tempo and mode based on data on birds to infer how the Atlantic and Amazonian forests were in contact in the past.

S02.OC.05

Historical biogeography of the Antbirds (Thamnophilidae): investigating the splendid isolation of South America

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South America was an island-continent during most of the second half of the Cenozoic, a period known as “splendid isolation”, in which several groups evolved. One of these groups is the family Thamnophilidae (antbirds), an endemic Neotropical family of passerine birds that primarily includes forest specialists. This makes this family an ideal group to study the historical biogeography of forested habitats. We produced a time-calibrated molecular phylogeny using three mitochondrial genes, one coding nuclear gene, and an one nuclear intron for a total of 178 out of 223 species. The phylogeny was inferred using Bayesian methods and a relaxed log-normal molecular clock, with a constrained prior estimate of the divergence time between Acanthisittidae and other Passeriformes. The results were used to infer the biogeografical history of the Thamnophilidae using a set of six areas with the diversification–extinction–cladogenesis model, and a Bayesian approach to DIVA analysis. Our results showed that antbirds started their diversification in Amazonia during the Early Oligocene, colonizing other areas only in the Middle Miocene. Northern areas were colonized first; Mesoamerica and the Caatinga were reached about 17-16 Mya, and the last was separated from Amazonia during subsequent aridification. The connection between Amazonia and the Atlantic Forest had two main stages. One occurred between 15.4-9.9 Mya, during a period of high global temperatures and marine transgressions. Fossils support the existence of forests in the West between 10°S-20°S and a possible continental connection between these two areas. The second stage occurred between 4.6-2.3 Mya, coinciding with high global temperatures and high sea levels. The aridification in the central South America at this time suggests a route from the Amazon basin to East coast. The diversification of Andean taxa began in the Middle Miocene and that of the Cerrado taxa only during the end of Late Miocene.

S02.OC.06

Phylogeography of an Atlantic Forest montane bird: genetic structure and population expansion

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Comparative phylogeographic analyses aim to comprehend the biogeographic processes that shape and maintain the genetic structure of organinsms. Atlantic Forest studies, however, suggest a complex biogeographic history, with taxa exhibiting both concordant and discordant spatial and temporal philogeographic patterns. These patterns can result from distinct processes that might be consequence of life-history traits such as physiological tolerance associated to distinct altitudinal distributions. In this context, a phylogeographic analysis of the Drab-breasted Pygmy-Tyrant (*Hemitriccus diops*), a montane bird reaching up to *ca.* 1300 m a.s.l., aims to gain insights in the evolutionary processes underlying the phylogeographical and population history of foothill vertebrates from the Atlantic Forest. To our knowledge, this is the first phylogeographical study of a truly montane Atlantic Forest bird. We sequenced 965 base pairs from the mitochondrial gene ND2 from 30 individuals collected throughout the range of this species, from the state of Bahia south to the state of Paraná. Preliminary results show a shallow but clear phylogeographical break in the central region of the Atlantic Forest. Historical demographic tests (Fu's *Fs* and Ramos-Onsins & Rozas R_2) performed for each of the two phylogeographical groups revealed that populations have undergone expansion in both northern and southern Atlantic Forest. The phylogeographical break recovered in our study is discordant from the pattern reported for another Atlantic Forest montane vertebrate, the frog *Proceratophrys boiei*, which shows a more prominent phylogeographical structure and demographic stability over the entire species' range. The demographic expansions recovered in our study suggest forest instability in both north and south regions. These discrepancies highlight the complexity of montane forests in the region and the likely distinct responses of vertebrates to the same evolutionary processes. Funding: FAPESP, CAPES, and CNPq.

S02.OC.07

Atlantic forest plant phylogeography

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Brazilian Atlantic Rainforest (BAR) is a biodiversity hotspot with more than 13,000 Angiosperm species of which more than 6,000 are estimated to be endemic. It is considered one of the most threatened biomes in the World, and despite its fragmentation and habitat loss, many species are still being described. BAR has a complex topography influenced by Tertiary and Quaternary events, and presents strong seasonality and orographic driven rainfall. Historical demographic events following the Last Glacial Maximum have left genetic signatures in many species, and these signatures are different in populations from historically stable regions (refugia) from those that are from re-colonized areas.
Our aim is to investigate the current genetic structure and the past demographic processes that may have driven the evolutionary history of plant species from the BAR. Here I will present the results obtained with *Passiflora* L. (Passifloraceae) species associated with this forest habitat, and compare it with other plants in the same area. We used information from nuclear and plastidial molecular markers to access their genetic variability and infer their phylogeographical and biogeographical history. We tested the previously proposed refugia and investigate the disjunctions along the range of the species' distribution.

S02.OC.08

Narrow endemism in the central corridor of the Atlantic forest

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Paleomodeling of the Atlantic forest infers relatively high stability of rainforest habitats in the central corridor of the Atlantic forest. From this, we predicted that this as-yet poorly known region would have high diversity and geographically fine-scale endemism, especially in low dispersal species such as frogs and reptiles. Fauna surveys, combined with multilocus phylogeography and phenotypic analysis of target taxa, have demonstrated just this. Across several amphibian and reptile taxa, we observed multiple lineages/species distributed across northern Espirito Santo through coastal Bahia, with high complexity in southern Bahia and divergent lineages in the brejos of interior central Bahia. In additional, several new, phenotypically distinct species were discovered, often at single localities. The results support the notion that paleomodeling of habitats can predict geographic patterns of endemism and we suggest that further, taxonomically broad, surveys of this region are warranted. Further, the results highlight the extraordinary and unique diversity of this highly threatened rainforest and should be used to inform and promote conservation strategies for the region.

S02.OC.09

Adjustments of physiology on long and short timescales: implications for species distribution

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Understanding the extent to which the heterogeneity of environment acts as a barrier to the distribution of species is important in diverse types of ecological analyses from phylogeography to climate-change conservation. One increasingly common approach has been using the current distribution of species to deduce physiological tolerances. This approach is useful under various contexts, but has limitations for i) assuming that current distribution reflects physiological optima and ii) forcing dialog among databases that may be valid at different scales. However, current distribution and physiology may not be in equilibrium, and behavior may greatly decrease exposure to stressful conditions in manners that would be understandable only at the microclimate level. These considerations are essential for proper inference regarding the responses of species to climate change at various temporal scales. In this talk I discuss briefly these issues using examples from the anuran fauna of the Brazilian Caatingas.

S02.OC.10

Integrating physiology, modeling and phylogeography of Atlantic forest lizards at multiple scales

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Theory and accumulating empirical evidence suggest that tropical lowland organisms are specially vulnerable to future warming because of narrow thermal tolerances, limited capacity to acclimate or adapt, and narrow safety margins - the notion that environmental temperatures experienced are close to organisms' thermal limits. These predictions might be especially true for species living in tropical areas that have might been climatically stable. Models of species distributions under different climate scenarios are pervasive tools to understand past changes and forecast responses to climate change. But how accurately niches are reflected on current distributions remains an open question. Of particularly importance are the connections between macroclimate, microclimates, and species tolerances, which mechanistically link functional traits of organisms and their environments at relevant scales. Here we test: (1) how whole organism responses to temperature evolve and relate to microclimates they experience and (2) how species distribution models can inform and be informed by physiological limits. We test hypotheses about the evolution and reversible acclimation of critical (Ctmax and Ctmin) and voluntary thermal limits, and thermal tolerances in three widespread and phylogeographically structured lizard groups from the endangered Brazilian Atlantic Forest. Preliminary results with one lizard group show variation in CTmax, CTmin, and thermal tolerances among lineages that cannot be attributable to reversible acclimation. Safety margins are broad if calculated with CTmax but narrow when calculated with maximum voluntary thermal limits. We explore how differences in microhabitat use and thermal limits among the lizard groups that share the same macroclimatic conditions help explain species-specific patterns. More broadly, we use this as an exercise to understand the history of the Atlantic forest and its fauna. Additionally, we aim to help shape the role of species distribution models in forecasting biological responses to environmental change.

S02.OC.11

A mechanistic model linking niche theory, community ecology and biogeographical patterns in tropical ecosystems

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Available niche models are single-species approaches that either ignore ecological processes (correlative models) or consider only a subset of relevant processes (mechanistic models). We present a multi-species model that simulates demography, biotic interactions and speciation in a metabolic framework. Stage-structured populations of species with different traits and habitat requirements competed for space in hypothetical landscapes. We considered density-independent (temperature) and competition-mediated density-dependent variables (space) fully representing the Hutchinsonian niche concept. We investigated emerging patterns of single species (realized niches and abundance distributions) and of communities (richness and speciation patterns) at tropical temperatures. Communities consisted of surviving species distributed heterogeneously within the parameter space. Species richness showed complex patterns related to landscape age, isolation, area, and temperature. 10% of all species had their abundance distribution shifted from what was expected by the distribution of suitable habitat. This means that these species were more abundant in suboptimum conditions. Almost half of all species were unable to fill their potential range. Factors that decreased the species ability to fill their ranges included stronger competition pressure (i.e. increasing species richness) and traits not related to climate (i.e. increasing Allee effects and decreasing dispersal ability). Results indicate potential bias of niche models if demographic constraints and competition are neglected. Moreover, competitive exclusion provides a mechanistic explanation for the low spatial transferability of single-species niche models. The approach offers a theoretical tool for investigating range dynamics, community and biogeography. Accordingly, comparison with data can be done for multiple ecological levels and patterns. The importance of such theoretical tool is particularly high for species-rich tropical ecosystems, since the number of species was shown to affect both species and community patterns by influencing the strength of resource competition.

S02.OC.12

Climate Change and Temperature Tolerance in Endemic Hawaiian Picture-winged Drosophila on the Slopes of Mauna Loa Volcano, Hawaii Island

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The remote Hawaiian Islands in the middle of the Pacific Ocean are home to an amazing array of endemic species that have evolved and adapted to the diverse ecosystems on these islands. Recent climate change in the Hawaiian Islands coupled with invasive species, native ecosystem damage and habitat fragmentation creates the potential for an ecological meltdown that will dramatically alter the native biodiversity. The Hawaiian *Drosophila* are a showcase of this evolutionary diversification with upward of 800 endemic species found on the high islands of Hawaii. Here we show that two Hawaiian picture-winged *Drosophila* species found on the slopes of the Mauna Loa volcano posses temperature tolerances that can impact their ability to persist in the face of the multitude of environmental stressors. *Drosophila silvestris*, a rarer and declining species, was significantly less tolerant to high temperatures in terms of survival and sperm mobility but more tolerant of cold temperatures than the much more common *D. sproati*. Gene expression analyses reveal that males in both species exhibit physiological stress at moderate temperatures well below the temperatures that cause mortality. In addition, two populations of *D. sproati* located 6km apart along an elevation gradient showed significant differences in temperature adaptation over a remarkably short geographical distance. Males from the high elevation population showed reduced courtship while males from the low elevation population showed increased courtship at moderately high temperatures compared to cooler temperatures. Males from both populations showed significantly reduce tolerance to high temperatures and superior tolerance to cold temperatures compared to females. Gene expression analyses in males from the two populations revealed opposite patterns of expression to moderately high temperatures. These gene expression techniques offer the potential for identifying candidate genes that could be used to monitor natural populations and permit more rapid determination of ecosystem stress.

S02.P.01

Phylogeographic structure of *Leptolobium dasycarpum* (Leguminosae, Papilionoideae) in the Brazilian Cerrado

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Phylogeography studies allow inferences of different aspects of natural history, contributing to understand patterns and processes related to the origin and changes of biodiversity in phytogeographic domains. The Cerrado is the second largest vegetation domain in South America, and performed by a mosaic of vegetation types. We are examining here the phylogeographic patterns of *Leptolobium dasycarpum*, a legume tree widely found in the Cerrado. DNA is been extracted from leaflets of individuals sampled throughout the species distribution, according to herbarium and field registers. We amplified the plastid DNA sequences (intergenic spacers *psbA-trnH*, *trnL-trnF*, *trnG-trnS*, *trnV-trnM*, *psbC1-trnS1* and the *trnL intron*) and nuclear DNA (internal transcribed spacer region of the ribosomal DNA - *ITS*). The PCR products were purified by 20% polyethylene glycol precipitation. Each PCR product will be double-strand sequenced in partner institutions. Relationships between sequences will be inferred through median-joining in the *Network* program, and diversity indices, neutrality tests (Tajima's D and Fu's F_S), pairwise mismatch distribution and AMOVA will be performed in the *Arlequin* program. So far we collected leaflets of 74 individuals of seven populations (distant from each other from 40 to 980 km). The best method of collection and DNA extraction was the preservation of leaflets in 95% ethanol and extracted by standard procedure with 2% CTAB. We started the sequencing of amplified DNA using the plastid DNA molecular markers. Morphological characteristics (shape and pubescence of leaflets) indicated a possible occurrence of hybridization between sympatric populations of *Leptolobium dasycarpum* and *Leptolobium elegans*. We expect to confirm or not the hybridization by studying the reproductive biology and molecular markers from both species. This work is part of the interinstitucional project GENPAC - Geographic Genetics and Regional Planning for the Conservation of Natural Resources in the Cerrado.

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S02.P.02

Transferability of nuclear and chloroplast microsatellite markers for conservation genetic studies of the inselberg bromeliad species *Vriesea botafogensis* Mez.

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The Brazilian Atlantic Forest (AF) is recognized as one of the 25 biodiversity hotspots in the world. In the Rio de Janeiro State this forest is surrounded by distinct marginal plant communities which are floristically related to the core forest (i.e. the rainforest *stricto sensu*) but differ in the type of stress they are seasonally or occasionally subjected to (Scarano, 2002). These marginal communities could be classified into different types: restingas, swamp forests, coastal semideciduous dry forest, costal inselbergs, high-altitude fields and Araucaria forests (Scarano et al, 2005). Traditionally, conservation genetic studies on the AF mainly emphasize species from the core formation rather than these marginal habitats. *Vriesea botafogensis* Mez. is a rupicolous bromeliad endemic of costal *inselbergs* located in the metropolitan region of Rio de Janeiro. Because of its restricted and fragmented population, and its small population size, *V. botafogensis* is considered an endangered species (MMA, 2005). This study examines the transferability of 10 nuclear (*nu*SSRs) and 12 chloroplast microsatellites (*cp*SSRs) markers previously describe to others species (Weising & Gardner, 1999; Palma-Silva et al, 2007; Paggi et al, 2008; Palma-Silva, 2008). Leaf tissues were sampled from the "Parque da Chacrinha" population in Copacabana. Several PCR conditions were tested (T*m*; $MgCl_2$ concentration, number of PCR cycles etc). PCR products were separated by electrophoresis in 5% denaturing polyacrylamide gels and silver stained. Two of the 10 *nu*SSR were successfully amplified under the optimal conditions, but only one allele was observed per locus. Greatest results were observed for the *cp*SSR loci. All the 12 cpSSR loci tested were successfully amplified in *V. botafogensis*. Nevertheless, again only one allele was observed per locus. This low genetic diversity observed probably is related to the fact that we examined only a single *V. botafogensis* population. New field trips are planned to locate and sample the other two remaining relictual populations.

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S02.P.03

Drivers of diversity per genus in South-American crickets (Orthoptera: Grylloidea)

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Assuming monophyly, number of species per genus may result from differential evolutionary age and diversification rates. Recorded distribution area may result from research intensity, and large-body genera may be more easily collected. We aimed to evaluate if genus diversity may be empirically explained by distribution area and body size. We analyzed all Neotropical cricket species reported in the Orthoptera Species File, counting number of extant species per genus. Body size was estimated by hindfemur length. We adjusted Poisson GLMs, corrected for overdispersion when necessary, with species richness as response variable, and body size, distribution area, area discontinuity (factor) and their interaction term as explanatory variables (ANCOVA). We considered 242 species, of 89 genera. There was an interaction of continuity with area ($Chi^2_{1,85}$=5.49; p=0.019): diversity increased with area ($Chi^2_{1,87}$=73.63; p<0.0001), but this increase was higher and steeper in discontinuous than continuous areas ($Chi^2_{1,86}$=43.21; p<0.0001). Diversity increased with body and area in both continuous (body: $Chi^2_{1,72}$=25.99; p<0.0001; area: $Chi^2_{1,72}$=21.71; p<0.0001) and discontinuous (body: $F_{1,13}$=5.39; p=0.037; area: $F_{1,13}$=22.64; p=0.00037) distribution areas. Discontinuous distribution records may either underestimate actual distribution area, or overestimate the genus scope. Genera with discontinuous records may amalgamate more than one actual genus. As our data were restricted to a single continent , we consider that sampling effort was comparatively homogeneous, reducing the eventual effect of researcher effort differences among genera. Therefore, biological processes are a more suitable explanation for the detected area effects. The increase of diversity with body size was opposite to our expectations. This could result from sampling effect, where larger cricket species with smaller body size would be under-represented due to taxonomic issues. We conclude that cricket distribution data, although sparse and not-systematic, are relevant to explain species diversity among genera. The biological processes involved in the empirical relationships that we highlighted deserve further investigation.

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S02.P.04

Study of the critical temperature maximum in arthropods biomes

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The Earth's climate is changing at an unprecedented rate with unknown consequences for wildlife. This work aims to understand the consequences of these changes in the specific context of the arthropod fauna, with the expectation that the results allow us to improve the theoretical framework in broader contexts. The proposal is applied in the disciplinary convergence known as macrophysiology, which studies and compares the physiological variation along the marked geographic regions (e.g. biomes). The initial focus is to understand if evolution in certain biomes modulates physiological limits to abiotic factors, specifically temperature. In particular, we intend to investigate a specific physiological parameter, critical temperature maximum (CTmax), in a large number of arthropod species in different geographic areas. To meet this goal we tested so far about 400 individual arthropods representing at least 30 morphospecies. These tests were made in an apparatus specifically developed by Sable Systems® to evaluate CTmax in arthropods. All animals were collected using the same method. The results so far with arthropods from three Brazilian biomes (Atlantic Forest (A), Savannah(B) and Atlantic Forest of altitude(C)) show clear differences among the A Ctmax (Mean 35.6 ± SD 2.95),compared B Ctmax (Mean 38.9 ± SD 4.05) and C Ctmax (Mean 39.2 ± SD 5.99) (ANOVA $F_{81.01}$, $p<0,05$). No difference was found between B and C Ctmax. These results demonstrate no clear pattern in physiology diversity related with the climate in the biomes studied so far. Any way we believe that is a very important start to understand the physiology diversity of arthropods.

S02.P.05

Phylogeographic study of *Araneus guttatus* and *A. omnicolor* (Araneae: Araneidae)

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Although Brazilian Atlantic Rainforest is considered a hotspot biome for conservation, few studies focus on its species' phylogeographical patterns, especially on invertebrates. To contribute to the knowledge of the Brazilian Atlantic Rainforest's history, this work investigated and compared the historical and evolutionary processes related to the diversification of two common Brazilian spider species. *Araneus guttatus* is widely distributed throughout South America while *A. omnicolor* occurs only from southeastern Brazil to southern Argentina. We sequenced a 548bp COI mitochondrial region of samples collected in Brazil in 6 locations along Atlantic Rainforest, where species are sympatric. Our data suggest that the two species diverged during Miocene. Molecular diversity and genetic structure are similar in both species, indicating that habits and dispersal abilities are alike. The haplotype networks indicate that species radiated at about the same time but with very different patterns of geographical expansion. Relative to *A. guttatus*, *A. omnicolor* seems to have spread along its current geographical range more recently, what may be related to its restricted distribution.

S02.P.06

Testing ecological niche models to predict the anuran species occurrence in fragmented landscape

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Ecological niche modeling provides the potential geographic occurrence of species and suitable habitats, which are useful to identify conservation-priority. Anurans are considered excellent bioindicators of environmental quality. We selected five anuran species more associated to forested habitats (*Aplastodiscus leucopygius*, *Aplastodiscus perviridis*, *Haddadus binotatus*, *Ischnocnema guentheri* and *Proceratophrys boiei*) and built distribution models in highly fragmented Atlantic Forest in Brazil, with the maximum entropy algorithm (MAXENT), using secondary data. The purpose was to compare the relative importance of potential geographic distribution and landscape metrics to predict the species occurrence. We sampled the occurrence of species by playback and active sampling methods in fifteen landscapes (1250 ha), between 2010 and 2011. We used logistic regression models and the Akaike Information Criteria to evaluate the relative importance of each variable. Only *Ischnocnema guentheri* showed a consistent model, and was built by landscape metrics. At least for this species the effects of fragmentation were more important to explain the current distribution than the potential geographic distribution. Thus, we urge caution in the use of ecological niche modeling that overestimate species occurrences in fragmented landscape. The results provided a critical assessment of conservation priorities in studies that were based only in niche modeling. We are grateful to FAPEMIG for the financial support.

S03.OC.01

One species is many: Unrecognized levels of diversification of tropical macrolichens in neotropical paramos

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About 15% of the known Fungi are lichenized, forming a symbiosis with photosynthetic green algae or cyanobacteria, resulting in morphologically distinct entities perceived as a single organisms, the lichens. Contrary to most other organisms, lichens are believed to be most diverse in temperate zones, but in fact, their diversity is highest in the tropics. Thus far, the highest species numbers have been reported from tropical lowland rain forest, with up to 600 species per hectare. Yet, also in tropical latitudes, lichens are most conspicuous in the upper montane belt, particularly montane cloud forests and paramos, although their diversity is believed to be substantially lower, with up to 200 species per hectare. Recent molecular studies are challenging this view, especially for macrolichens which are considered well-studied. One example is the genus *Sticta*, one of the most prominent macrolichen taxa, for which usually 10–20 species are identified in neotropical paramo regions. Molecular analysis of specimens from Colombia shows that these morphologically defined taxa actually represent a much larger number of species which, even if morphologically similar, are not even closely related. Using an ITS phylogeny, over 150 species have been identified for Colombia alone, and comparable results were obtained from other macrolichen genera, such as *Dictyonema*, *Lobariella*, and *Phyllobaeis*. The basidiolichen genus *Dictyonema* is the most striking example: while previously one foliose species, *D. glabratum*, was recognized in neotropical paramos, a three-gene phylogeny demonstrates that there are at least 25 different species. A molecular clock analysis suggests that these clades diversified recently, suggesting an exceptionally high diversification rate of lichenized fungi, in particular macrolichens, in neotropical paramos. The studies also show that lichen species diversity in these ecosystems has been grossly underestimated: in the aforementioned genera, the ratio of actually existing versus previously identified species is at least 4.5:1.

S03.OC.02

Genomic RAD data resolve phylogeny and reveal hybrid introgression in a recently diverged clade of *Pedicularis* (Orobanchaceae).

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The difficulty of resolving species-level relationships is a pervasive problem in phylogenetic systematics. Near the tips of trees, and particularly in rapidly diversified clades, slow evolving markers lack sufficient phylogenetic signal to resolve polytomies, and developing faster markers is costly. Moreover, to account for incomplete lineage sorting, or test hybridization, multiple loci must be sequenced across many species. While formerly unattainable, such data are now generally affordable using multiplexed high-throughput sequencing protocols such as restriction-site associated DNA (RAD). In this case study, we show that genomic RAD markers are capable of resolving phylogenetic relationships in a recently diverged clade of *Pedicularis*, and that such data also allow fine-scale tests for hybridization. We detect hybrid introgression among geographically widespread species of *Pedicularis* at low elevations, and a lack of hybrid introgression among endemic taxa at higher elevations. The high elevation taxa also show greater diversity of floral morphologies. Geography thus appears to play a major role in mediating gene flow between species, where isolation may allow differentiation of floral morphologies and the development of species boundaries.

S03.OC.03

Diversification in a large alpine/arctic genus, the primroses (Primula L.)

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Primula L. (primroses) is a large alpine/arctic genus with ca. 430 species in the major mountain chains of the northern hemisphere and one in Patagonia. Most of the species diversity is concentrated in the Sino-Himalayan mountain region. Primroses are characterized by variation of floral morphology (heterostyly to homostyly), breeding system (outcrossing to selfing) and ploidy levels (diploidy to dodecaploidy). While these traits have undoubtedly contributed to the diversity of the genus, the specific processes remain unclear. Using a combination of phylogenetic methods, ecological niche modeling, quantitative morphological analyses, and field experiments, we are trying to disentangle how the mentioned traits shaped species diversity at different taxonomic and geographic scales. At the genus-wide, global level, our phylogenetic analyses suggested that the evolution of heterostyly drove an increase in diversification rates. At the sectional, continental level (in the European species of *Primula* sect. *Aleuritia*) we have shown that coordinated switches to polyploidy and homostyly may have been crucial for the origin of new species after glacial retreat during Pleistocene climate cycles. By incorporating ecological niche modeling in the same section we are now testing whether the current ecological preferences of related diploid and polyploid species differ from each other and whether distributional ranges changed in response to Quaternary glacial cycles. Comparisons of sexual organ reciprocity within and between closely related, heterostylous primroses of *Primula* sect. *Primula* revealed a reduction in the degree of reciprocity between *P. elatior* and *P. vulgaris*, suggesting a possible contribution of this interspecific discontinuity to reproductive isolation. Finally, by controlling access to pollinators in different field treatments of the high alpine, homostylous *Primula halleri*, we were able to demonstrate that small differences in the degree of separation between male and female reproductive organs strongly affect the potential for reproductive assurance.

S03.OC.04

Understanding the diversification of microendemic montane species in the Brazilian Atlantic Rainforest by integrating environmental niche modeling and phylogeography of co-distributed taxa

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Recent studies on the population genetics of lowland species in the Brazilian Atlantic forest have evidenced considerable chances in geographical distributions during the Pleistocene, with large regions being recolonized from a few localized refugia. This scenario is intriguing, given that montane habitats in the Atlantic forest are known to harbor a variety of highly endemic species that probably did not experience such dramatic shifts in distribution, yet little is known about the mechanisms underlying their diversification and distribution during the recent evolutionary past. In this study we integrate environmental niche modeling (ENM), phylogeography, and Bayesian species delimitation methods to provide a comprehensive analysis of the diversification of three vertebrate taxa: red-bellied toads (*Melanophryniscus* spp., Anura: Bufonidae), saddleback toads (*Brachycephalus* spp., Anura: Brachycephalidae), and tapaculos (*Scytalopus* spp., Formicariidae). These taxa are commonly characterized by species with remarkably small geographical ranges, limitations to high-elevation habitats (usually above 800 m a.s.l.) and rare cases of congeneric sympatry. First, we compiled a comprehensive dataset of species ocurrence records, including several new species that are currently being described and delimited. A modification of ENM using Maxent but allowing for the analysis of ensemble interspecific datasets indicated the existence of a few clusters of species with climatic niches that were geographically concordant among taxa, suggesting common mechanisms leading to their isolation in montane habitats. Moreover, these clusters were consistent with independent evidence based on multilocus genetic datasets from each taxon. Finally, extended Bayesian skyline plots were consistent with the demographic stability of montane populations at a timescale in which lowland species were experiencing substantial changes in their populations. These results strongly indicate that a combination of niche conservatism and climatic stability might have been responsible for the formation of the highly endemic taxa in montane habitats of the Atlantic rainforest.

S03.OC.05

Plant diversification in Brazilian "campos rupestres"

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The Brazilian *campos rupestres* ("rocky fields") has the highest number of endemic and rare plant species among all the Brazilian habitats. It is characterized by patches of characteristic vegetation generally occurring above 900m elevation, mostly in the Espinhaço mountain range. Isolation during long periods of climatic fluctuation is presumed to have promoted the genetic differentiation of plant populations in disjunct patches of *campos rupestres*, creating autochthonous floras. However, morphological convergence in distantly related plants also suggests that adaptation has shaped this flora, with selection pressures arising from extreme conditions such as litholitic soil and high UV radiation. In this study, we evaluate plant diversification in the family Velloziaceae, one of the most diversified lineages in the *campos rupestres*. Of the 250 species in the family, almost 220 occur only in the *campos rupestres* (ca. 30 species occur in Africa, and the sister group of the family, *Acanthoclamys bracteata*, occurs in China). A recent phylogeny of Velloziaceae reveals a significant difference in net diversification rates between South American versus African clades of Velloziaceae, which may be due to higher speciation rates in South America. Analysis of vegetative traits that could have functional roles in hydric stress regulation, such as the presence/absence of leaf furrows, leaf trichomes, aquiferous hypodermis, and aquiferous parenchyma between bundles, does not indicate an association between trait evolution and clade diversification. Thus, there is yet no evidence that extreme ecological conditions, such as hydric stress, could have driven the diversification of Velloziaceae in the *campos rupestres*. Other traits involved in ecological interactions, especially floral/reproductive traits, still remain to be investigated in this context.

S03.OC.06

Diversification rate and functional trait shifts: consequences of Forest - Fynbos transitions in the Cape Floristic Region

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The interaction between habitat and morphological-physiological features of plants should impact their diversification, resulting in unevenly distributed diversity patterns in space and time. We tested this in the Cape Floristic Region (CFR) of South-Africa, where pyrophytic species-rich heathland (fynbos) and non-pyrophytic species-poor Afromontane evergreen forest occur intermingled. Three plant families (Penaeaceae, Rutaceae and Rhamnaceae) contain paired clades, with a species-poor clade restricted to forest and a species-rich sister clade to fynbos. We hypothesize that this shift in community is associated with the evolution of plant functional traits linked to insolation, regular fires, and drought stress. Phylogenetic trees for the three families were calibrated and dated in BEAST and diversification rate shifts were recognized in MEDUSA. Maximum Likelihood character reconstructions for SLA, leaf area and maximum plant height were performed in Mesquite and phylogenetic signal was tested using Pagel's lambda. Using paired forest-fynbos sites, we show that these traits are typical of their "host" vegetation types. Our results indicate that smaller leaves, a low SLA and a decrease in height, associated with the fynbos habitat, preceded the increase in diversification rate in Penaeaceae and Rhamnaceae. Rutaceae shows a slowdown in diversification rate associated with an increase in leaf area, SLA and plant height, the attributes associated with the Afromontane forest habitat. The rate shifts occurred in the Late Miocene, when the CFR possibly experienced a period of seasonal aridification and regular fires started to shape the environment. This could have provided the ecological opportunity for species with the "right" set of traits to expand into the newly available pyrophytic fynbos habitat space.

S03.P.01

Insights into the historical construction of species-rich Mesoamerican seasonally dry tropical forests: the diversification of *Bursera* (Burseraceae, Sapindales)

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Mesoamerican arid biomes epitomize neotropical rich and complex biodiversity. To document some of the macroevolutionary processes underlying the vast species richness of Mesoamerican seasonally dry tropical forests (SDTFs), and to evaluate specific predictions about the age, geographical structure and niche conservatism of SDTF-centered woody plant lineages, the diversification of Bursera is reconstructed. Using a nearly complete Bursera species-level phylogeny from nuclear and plastid genomic markers, we estimate divergence times, test for phylogenetic and temporal diversification heterogeneity, test for geographical structure, and reconstruct habitat shifts. Bursera became differentiated in the earliest Eocene, but diversified during independent early Miocene consecutive radiations that took place in SDTFs. The late Miocene average age of Bursera species, the presence of phylogenetic geographical structure, and its strong conservatism to SDTFs conform to expectations derived from South American SDTF-centered lineages. The diversification of Bursera suggests that Mesoamerican SDTF richness derives from high speciation from the Miocene onwards uncoupled from habitat shifts, during a period of enhanced aridity resulting mainly from global cooling and regional rain shadows.

S03.P.02

Novel pollination syndromes and growth forms fostered major cactus diversification events in semiarid landscapes of North and South America

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The cactus family (Cactaceae, Caryophyllales, Eudicotyledoneae) has been regarded as one of the most remarkable adaptive radiations of plant lineages on Earth. Although its members inhabit almost all existing vegetation types and show a striking diversity of growth forms, a large number of species are conspicuous and characteristic elements of arid and semiarid vegetation types both in North and South America. Due to its adaptations to withstand waterless environments, diversification within Cactaceae has been thought to be caused by the origin and expansion of these climates in America. In this study, we combine the results of a detailed estimation of divergence dates, together with analyses of diversification rates and ancestral reconstruction of characters and geographic ranges, to understand the diversification of the family. Our results show that in addition to the richest genera (*Opuntia* and *Mammillaria*), the North American core Pachycereeae, a clade that includes the columnar and arborescent cacti; the Central American clade Hylocereeae, including epiphytic cacti; and the South American clade Trichocereeae, which also includes columnar and arborescent forms, correspond to the major radiations within the family, which occurred recently and independently. The evolution of distinct pollination syndromes together with a columnar or epiphytic life form is coincident with the shifts in diversification rates observed within these clades, suggesting that main diversification events within Cactaceae might be more related with the origin of novel reproductive strategies.

S03.P.03

Evolution and diversification of the high altitude Liliputana Alliance species complex (Orchidaceae: Laeliinae), endemic to the Southern Espinhaço range, Brazil.

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The rupiculous *Cattleya* species (*Cattleya* sect. *Parviflorae*) is a recent expanding species complex distributed along the high altitude rock outcrops of Espinhaço Range Region (ERR). The geography of Espinhaço mountains and the discontinuous nature of rock outcrops promoted a incredibly high level of morphological diversification and microendemism. However, the species low reproductive rates, illegal collection and habitat loss have produced local extinctions, threatening species viability for long term. Indeed, one species is already extinct in nature and sect. *Parviflorae* figures as one of the most threatened orchid complex of Brazil. In order to understand the evolutionary processes underling diversification of rupiculous *Cattleya*, we collected floral and vegetative samples for morphometric analysis, DNA samples for sequencing and generated ecological niche models (ENM) of four *Liliputana* Alliance (LA) species, endemic to the southern part of ERR. Morphometric analysis of 32 continuous floral and vegetative characters of 8 population and 124 individuals was able to recover most of actual taxonomic classification, but suggested two synonymizations of highly endemic species in the Iron Quadrangle (IQ), southern limit of ERR. Interestingly, the IQ geographic mosaic structured the morphological diversity in an East/West base around Rio das Velhas valley, with some interchange through Serra do Ouro Branco. Analysis of *Cattleya* sect. *Parviflorae* distribution indicated that IQ is a center of rupiculous *Cattleya* diversity. ENM models were produced and validated over the range of the species distribution. Modeling results indicated that LA species richness is concentrated at high altitude areas of Serra do Caraça, Serra do Gandarela and Capanema summit. Ecological niche analysis suggests that LA species occupy a restricted ecological niche and evolved under global niche conservatism, with possible micro-niche specializations. Plastidial sequencing and microsatellite analyses are underway to test population diversity, structure and levels of species hybridization along distribution areas. This work may elucidate the major trends in *Cattleya* sect. *Parviflora*e diversification at ERR and generate valuable data for conservation and management of one the most threatened orchid species complex in Brazil.

S03.P.04

Study on avian diversity in the Ramsagar National Park site of Dinajpur district within Bangladesh

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The Indian subcontinent has a rich and diverse avifauna as more than 1200 bird's species and 900 subspecies have been described from this region (Ali & Ripley 1983). Research at community level of birds in the Indian subcontinent is essential. There is a need to study the diversity of birds of different areas of Bangladesh to investigate the impact of changing natural habitats. A study of avian diversity in the Ramsagar National Park site of Dinajpur district within Bangladesh was carried out by the direct observation during May 2010 to September 2011. A weekly observation was carried out on systematically walked routes through the study area and all types of habitats. The time schedule chosen for study was from 06.00 a.m. to 10.00 a.m. in morning, and 16-00 p.m. to 18-30 p.m. in evening. Observations were carried out with the aid of 8-16x40 binocular and field characteristics were noted down on data sheets. The birds were identified up to species level with the help of standardized books (Ali and Repley, 1983 and Richard Grimmett & Inskipp, 1998). The status was assessed as resident and local migrant based on observation and previous records. A total 59 species of birds belong to 24 families are recorded, where 48 species were resident and 11 species are local migrants. The birds were also classified into eight categories on the basis of their food habits such as insectivores, nectarivorous, omnivorous, scavengers, frugivorous, predators, piscivorous, and granivores. Although more than 50% of the birds in the study area were insectivores. The Ramsagar National Park site has a notable variety of trees. Insect fauna is variable and found thought the year. Its density increases in monsoon period. Status of birds as well as their habitat and feeding habits were studied.

S03.P.05

Exploring the floral evolution of Trimezieae (Iridaceae)

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Trimezieae (Iridaceae) consists of approximately 60 species divided amongst four traditionally recognized genera – *Neomarica*, *Pseudiris*, *Pseudotrimezia* and *Trimezia*. The tribe is broadly distributed in Central and South America but species diversity is centred on the "campos rupestres" of the Espinhaço Range (Brazil). In particular, *Pseudotrimezia* is restricted to this habitat type. There are two broad floral types in Trimezieae. *Neomaric*a, *Pseudiris* and *Trimezia* all have showy flowers, with differences in form, size, color and ornamentation. In contrast, the flowers of *Pseudotrimezia* are more uniform; all are yellow and lack ornamentation. Here we present some early findings from studies aimed at understanding the processes underlying these differences. Reconstructing floral character states onto a molecular phylogeny based on combined chloroplast and nuclear sequences indicates that the more elaborate floral type found in *Neomaric*a, *Pseudiris* and *Trimezia* is ancestral; surprisingly these analyses also suggest repeated shifts between this and the simpler *Pseudotrimezia* type flower. Our results imply these two floral forms represent stable combinations of states for an entire suite of characters. Similar results for other Iridaceae have been linked to differences in pollination biology and we are initiating studies to investigate this aspect more fully. Initial observations suggest both flower types are visited by bees and, at least for *Pseudotrimezia*, are outcrossing. Further observations are needed to determine whether there are differences in the guild of pollinators visiting different species of Trimezieae. Trimezieae provides a promising model for evolutionary research. It is a relatively small yet morphologically diverse lineage with much of that diversity restricted to a small geographical area. This group provides a unique opportunity to study, in detail, the processes involved in speciation and morphological diversification.

S04.OC.01

Savanna development in northern South America during the Neogene

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Neotropical rainforests hold one of the highest levels of biodiversity in the world. Orogenic activity and climatic fluctuations have triggered major changes in the landscape by shaping the evolution of their biota during the Neogene. But, how these physical processes have affected plant species composition in neotropical forests? We studied the palynostratigraphy of four Neogene sequences from northern South America located in eastern Colombia and western Venezuela, in which savannas and xerophytic vegetation, respectively, dominate the landscape at present. These sequences reach 8 Km of thickness providing a detailed record of environmental change over the Neogene. One of the most striking findings from our fossil record is the presence of a wet forest during the Miocene opposite to the modern biomes that characterize both areas now days. It seems that the expansion of neotropical savannas is a very recent phenomena that started at some point during the Pliocene and produced a continuous reduction in rainforest areal coverage over the past five million years. The dynamic of the landscape is also reflected by three discrete and well-defined flooding events, each one lasting less than one million years, that occurred during the early and middle Miocene. These three events seem to be associated to a continental-scale marine incursion and a large fresh-water lake already reported for northwestern Amazonia.

S04.OC.02

MOLECULAR PHYLOGENETICS AND THE PATTERN AND TIMING OF DIVERSIFICATION OF TOUCANS (FAMILY: RAMPHASTIDAE)

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Phylogenetic studies of Neotropical birds indicate that the timing and patterns of diversification are complex. Ultimately the comparison of patterns from multiple groups with different dispersal abilities has the potential to shed light on the mechanisms of diversification generally affecting Neotropical birds. The toucan family (Ramphastidae) has been a model for constructing generalized hypotheses of diversification patterns in the Neotropics. We reconstructed the phylogeny of nearly all toucan species and used a Bayesian relaxed-clock framework to calibrate this phylogeny to examine both the pattern and timing of diversification in this model group. Phylogenies constructed from these sequences were well resolved and well supported. Results support Amazonia as the region of basal diversification of the group, with varying patterns and timing of subsequent diversification in lineages found through out the basin today.

S04.OC.03

Relating spatial and temporal patterns of bird diversification to landscape evolution in Amazonia.

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The relationship between the origin and distribution of Amazonian species and landscape evolution is investigated through the reconstruction of the diversification patterns of several clades of birds and the correlation of these patterns to the information available about the history of Amazonian landscape, particularly the origin of the current drainage system and climate oscillations due to Pleistocene glacial cycles. Different groups of birds that occur in Terra Firme forest (genera *Psophia*, *Rhegmatorhina*, *Automolus* and *Dendrocincla*) and in open vegetation areas within Amazonia (genera *Xenopipo* and *Elaenia*) were studied using mitochondrial and nuclear markers. Sampling included several individuals from all Amazonian areas of endemism. Phylogenetic, phylogeographic, historical demographic and dating analyses show that: 1. Amazonian diversity is highly underestimated; 2. large rivers delimit lineage distribution in Terra Firme birds, but do not in most birds from open vegetation areas; 3. origin of current species dates to the last 5 million years, with several speciation events during the last 2 my; 4. recent (last 50 kya) demographic expansion is detected in both forest and open area lineages. These results agree with those for other groups of birds indicating that many Amazonian species originated during the Plio-Pleistocene. These species predate the LGM, but they are younger than the Miocene, indicating that neither refugia nor an old evolution of the drainage system can be associated with current species' origins. These results suggest a Plio-Pleistocene origin for the drainage system and a reorganization of population distributions during the glacial cycles in both forest and open vegetation birds.

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S04.OC.04

Timing of avian diversification in the Amazon basin: role of large rivers as vicariant forces

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Large Amazonian rivers are known as important biogeographical barriers since Wallace returned from the Amazon in 1852. Since then, many studies have documented the role of Amazonian rivers in delimiting species boundaries, particularly those of birds and primates. While it is quite clear that by inhibiting gene flow, these rivers are important in maintaining species diversity, it remains uncertain to what extent rivers were responsible in the generation of biodiversity. To address this question, we analyzed avian distribution patterns, phylogenetic relationships, and patterns of genetic differentiation in 60 pairs of avian taxa whose distributions are delineated by the lower Rio Negro and the Rio Branco, in the Guiana Shield. Consistent with the riverine barrier hypothesis, we found that rivers define the distributions of a substantial portion (~30%) of all forest-dwelling bird species in northern Amazonia. These pairs of closely related taxa, however, seem to have diverged from one another at an almost constant rate since the Pliocene, and no single event could be accounted responsible for their generation. Consistent with this scenario, we found no evidence of simultaneous divergence in 60 pairs of taxa across the Lower Rio Negro and 27 pairs across the Rio Branco, most of which are not even sister taxa. The establishment of the Rio Negro during the Lower Pleistocene, however, could be correlated with the origin of 8 pairs of taxa, all of which are each others' closest relatives and have originated between 0.7 and 1.2 Mya. These results suggest a limited role of some rivers in the generation of biodiversity, but argue against a general model of diversification lead by large Amazonian rivers that currently act as important biogeographical barriers.

S04.OC.05

Amazonia River Barriers: The Primates of the Rio Branco Rio Negro Region

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As early as the mid-19th century, Wallace suggested that major rivers acted as barriers to the dispersion of primates. Since then this observation has been confirmed by patterns of geographic distribution of the morphological variation in several groups of primates. Different primate species are expected to vary in their ability to cross rivers, but in general primates are potentially poor swimmers and crossing large rivers is possible only when tracts of land containing breeding populations are passively transported from one side of the river to the other in the process of oxbow lake formation. Amazonian rivers vary considerably in water chemistry, volume, water discharge, and width. Amazonian drainage evolution is recently being debated in the geological literature, and it is clear that rivers have different histories and ages. Thus, the role of different rivers as barriers is expected to vary greatly. We examine the role that the Rio Negro, Amazonas largest tributary, and Rio Branco, Negro's largest tributary, have as geographical barriers to primates. We surveyed both margins of these rivers and compared the primate species found. We also estimated the genetic distances between the pairs of congeneric species that occur in opposite margins of both rivers. The Negro and Branco are barriers to the Callithrichidae family and to *Sapajus*, both restricted to the South and East of the Negro/Branco interfluvium. *Chiropotes, Ateles, Cebus, Callicebus* and *Cacajao* are all split into different taxa by these rivers. *Aotus, Saimiri* and *Alouatta* were not examined in this study. These results show an important role for the Negro and Branco rivers in isolating primate populations, a pattern also seen in some Terra Firme forest birds. Further comparative phylogeographic and diversification dating analysis in these groups will be very informative in relating drainage evolution and diversification in this region.

S04.OC.06

Historical Biogeography of Amazonian and Atlantic Forest Gladiator Frogs (*Hypsiboas*)

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Diversity within the Amazon (AM) and the Brazilian Atlantic rainforest (AF) has been investigated extensively, though ongoing discoveries of new species indicate that we have yet to fully understand this. Although studies of these complex areas abound, relatively few examine them in a comparative context, especially in relation to historical vicariance or dispersal across the dry corridor separating them. Here, we inferred the evolutionary and biogeographic history of diversification in the AM and AF within the gladiator frog genus *Hypsiboas*. We incorporate two levels of study: phylogenetic diversity of two sister taxa (*H. geographicus* and *H. semilineatus*) within and between the two biomes, and the broader biogeographic history across the entire geographically widespread genus. We sequenced 2 mitochondrial and 4 nuclear loci of the sister taxa in order to perform phylogenetic and species delimitation methods. We found previously unrecognized lineage diversity within both regions as well as paraphyly of *H. geographicus*, with recent biogeographic connection between its northern Amazonian populations and southern/central Atlantic Forest populations of *H. semilineatus*. To examine the region's broader biogeographic patterns, sequences of other *Hypsiboas* species were obtained from GenBank and were used to construct a time-calibrated tree and implement spatial methods of ancestral state reconstruction. DIVA results suggest a Guianan Shield and southern Atlantic Forest origin at most ancestral nodes of the greater *Hypsiboas* phylogeny. Because these regions are geologically older than other South American domains, they may have acted as source populations from which Amazonian and Andean taxa repeatedly dispersed. These combined results suggest that the Amazon and Atlantic Forest are extremely dynamic systems influenced by a variety of historic processes.

S04.OC.07

Timing and biogeography of *Bignonia* L. (Bignoniaceae): A predominantly Amazonian Clade

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Bignonia is a monophyletic lineage that embraces 28 species of lianas formerly included in nine accepted genera of the tribe Bignonieae (Bignoniaceae). The genus is distributed throughout the Neotropics, and includes species that are often restricted to forests and only rarely occur in open areas. This project aims to understand the phylogenetic and biogeographical history of *Bignonia*, by estimating the times of divergence of various lineages within *Bignonia* and reconstructing the ancestral areas occupied by its taxa throughout the Americas. The phylogeny of *Bignonia* was reconstructed using three molecular markers (*ndh*F, *rpl*32-*trn*L and *pep*C), and Bayesian inference through Beast 1.7.1. The phylogeny of *Bignonia* was calibrating by setting the crown node age estimate at ~25mya (following Lohmann et al., submitted), and using an uncorrelated lognormal relaxed clock model, unlinked among markers. A biogeographical analysis was carried out in RASP using a S-DiVA approach, and the trees derived from the Beast analysis. The reconstructed chronogram of *Bignonia* suggests that that the four main lineages of this clade diverged before Mid-Miocene (~15mya), while the most recent cladogenesis events took place in the last 5my. The earliest diverging lineages in this genus were reconstructed as being primarily composed of Amazonian and Western South American + Central American taxa, with these same areas also representing the most likely ancestral areas for the genus. In addition, a single lineage (composed of former *Clytostoma* representatives) encompasses all species restricted to the Atlantic Forest and dry areas, suggesting a single colonization event of Eastern Brazil. Finer-scale studies of the distribution and biogeographic history of *Bignonia* might provide important insights into the assembly and diversification of the Amazonian Biota as a whole.

S04.OC.08

THE BRAZIL NUT FAMILY: A SYMBOL OF THE AMAZON

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The Brazil nut family (Lecythidaceae) is one of the dominant tree families in lowland Amazonian forests, but its species are also found in fewer numbers in periodically flooded forests and at higher elevations, especially in the Andes. In the 100 hectare control plot of the Biological Dynamics of Forest Fragments Project there are 45–149 trees over 10 cm DBH and 11–24 different species per hectare. The evolution of this family is driven by selection by different pollinators and dispersal agents. For example, species of the family are mostly pollinated by bees, but bat-pollination has been documented in two species, and beetles have been suggested as the pollinators of at least some species of *Grias*. Dispersal is accomplished by bats carrying away seeds and arils to eat the latter; peccaries eating the pulp and seeds of fruits of species of *Couroupita* and dispersing the seeds when they defecate; the wind blows away the seeds of species of *Allantoma* (*terra firme* species), *Cariniana*, and *Couratari*; and water currents wash away the seeds of riverine species such as *Allantoma lineata*, *Eschweilera rorida*, and *E. tenuifolia*. In addition, abiotic factors such as slope, soil type, and light availability, exert selective pressures on trees of the Brazil nut family. The first molecular phylogenies have been useful to circumscribe genera and to interpret some of the selection factors associated with pollination and dispersal. Future studies will be directed toward resolving relationships among the zygomorphic-flowered species and relationships among species within clades. The Lecythidaceae Pages (http://sweetgum.nybg.org/lp/index.php) provides the background data needed for more detailed studies of the systematics, evolution, and ecology of this iconic family of tropical trees.

S04.OC.09

Origin and evolution of the Chrysobalanaceae family: insights into the evolution of plants in the Neotropics

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Some plant families show a striking imbalance in species diversity between the Neotropics and the Paleotropics. The woody plant family Chrysobalanaceae is a typical example of this pattern, with 80% of its 531 species in the Neotropics. In order to test alternative interpretations for this pattern, we generated a dated phylogenetic hypothesis for Chrysobalanaceae, using DNA sequence data from one nuclear and six plastid markers. Using a maximum likelihood approach, we jointly inferred ancestral areas and diversification rates in the Neotropics and Paleotropics. We find that Chrysobalanaceae most likely originated in the Paleotropics about 80 Myr ago. The family dispersed into the Neotropics at least 4 times beginning 40-60 Myr with at least one back-dispersal to the Paleotropics. This family has experienced higher extinction, speciation, and net diversification rates in the Neotropics. Hence, the high species diversity of Chrysobalanaceae in the Neotropics appears to be primarily caused by a higher speciation rate in this region. Several recent studies showed high diversification rates in neotropical plant families, but they focused on Andean-centered taxa. Ours is the first study to evidence a similar pattern in a family whose center of diversity is in eastern and central Amazonia.

S04.OC.10

Diversity and Biogeographic Affinities of *Machaerium* Pers. in the southern Amazon Basin

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The genus *Machaerium* Pers. includes about 130 species of trees, lianas, and shrubs with distribution largely neotropical. The greatest diversity is found in Brazil with about 120 species. In Amazonia, the dominant life form is lianas represented by 29 of the 35 recognized species to Northern of Brazil. Our goal is to superimpose population density maps of *Machaerium* species over the geographic range of the same species to explore the environmental conditions under which species of *Machaerium* become dominant in tropical forests. To further this goal, we are mapping species density in both the Northern and Central Brazil. For this study, we completed a census of lianas in permanent plots from southern central Amazonia Cotriguaçu-MT (09°49'11.1"S, 58°15'31.4"W, mean annual temperature = 25°C, annual rainfall = 2034mm with a dry season from April to September). We collected lianas along 6km of access trails to our permanent plots to increase the chance of encountering species of *Machaerium*, and thereby compile a complete list of species. The flora of Brazil lists nine liana species of *Machaerium* for the Central Brazil and eight for the state of Mato Grosso (a subset of the Central Brazil). In Cotriguaçu alone, we have collected and identified nine species of *Machaerium* lianas: six (4) of which new records for the Central Brazil (*M. aureiflorum, M. caudatum, M. hoehneanum, M. ferox*). However of those six (4) species, four (all) are found in the Northern Brazil, which includes Acre, Amapá, Amazonas, Pará, Rondonia, Roraima, and Tocantins states. Of the nine species found in Cotriguaçu, six are endemic to Brazil and three have a wider geographic range. Within the Central Brazil, Cotriguaçu may be considered a hotspot of diversity for lianas of *Machaerium*, probably because the area has a moderate climate that can harbor species from both neighboring biogeographic regions. Cotriguaçu was sampled over an area of only 6km^2,and the Mato Grosso encompasses an area of 906.069km^2, and the Central Brazil represents roughly twice that. Our work clearly indicates that intensified plot-based sampling will increase knowledge of the flora of this transition zone.

S04.OC.11

Ecological correlates of diversification rates amongst neotropical trees

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Recent molecular studies have suggested that high rates of diversification are a feature of a range of phylogenetically unrelated clades of neotropical trees. However, the reason why these groups might share this characteristic remains unclear. We tested whether this variation in diversification rates was related to a range of ecological traits (generation time, seed dispersal mechanism, range size, maximum size) among a wide range of neotropical tree genera. We calculated diversification rates useing published dated phylogenies for seven clades containing more than 60 genera, and sourced trait and demographic data from a large network of Amazonian forest plots. We found that generation time was significantly related to diversification rates: genera characterised by low generation times had significantly higher rates of diversification. This finding is consistent with other studies indicating the importance of life history traits for determining diversification rates and suggests that the ecological characteristics of neotropical tree genera have had an important influence on the origin of the diversity of this biome.

S04.OC.12

Just how badly do we know the Amazon Flora?

Hopkins Michael JG

Given its huge size, high biodiversity and the many logistical, historical and bureaucratic problems involved in making botanical collections, it is not surprising that the overall collection density of plants is very low (probably <1 collection/10 km^2). Given the data available, it is possible that more than half the plant species of the Amazon Basin have not yet been described, or even collected. Modeling the rate of discovery of species suggests that Amazonian Brazil is at least 65 years behind any other region of Brazil in terms of the accumulation of taxonomic knowledge of its plants. The poor state of our knowledge is reflected in the relatively low numbers of species cataloged form Amazon states in the recently publish "Catálogo de Plantas e Fungos do Brasil". Examination of local data sets shows that improved identifications of material already in Amazonian herbaria would increase Amazon state lists by about 50%. Long term collection programs in areas known to be lacking in adequate coverage would probably result in many new records of occurrence, and many more species new to science. There is however a chronic lack of adequate resources for plant science in Brazilian Amazonia in comparison with the rest of Brazil, and a radical change of policy is needed if the taxonomy of the Amazon Flora will be sufficiently well know to support ecological, biogeographical and conservation related research.

S04.P.01

Aspects of richness and biogeography of Euglossini (Hymenoptera: Apidae) in Brazil

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The Euglossini perform key role in the maintenance of many plant species in Neotropical ecosystems, that without them could be lost, removed or have stopped their activity, thus achieved, individuals of higher trophic levels. This study aims to identify and analyze the species composition of the Tribe Euglossini (Hymenoptera, Apidae) occurring in the Brazilian territory, the wealth, biogeography and similarity based on published works. The work also aims to contribute significantly to knowledge of the Eglossini bee fauna of Brazil. For this work we used secondary data obtained from several publications on the wealth of Euglossini in Brazil. We checked a total of 25 Euglossini faunal inventories, distributed in almost all biogeographic regions of Brazil. In total were included in the data array 87 species in five genera. Most studies focused on the Forest Atlantic. Most studies have focused on the Forest Atlantic, to group most of the national scientific community and universities. In the reverse situation, is the central plateau of Brazil, Cerrado specifically occurring in the Midwest region, where studies are scarce, the region that concentrates one of the greatest diversity of insects in Brazil. The Amazon region concentrates more euglossine populations isolated from the other regions sampled, the similarity between the work undertaken in the region is relatively high. In general, the studies that have formed clusters more cohesive, present converging elements, such as using the same methodology and/or are geographically close and/or are located in biomes smaller. By contrast, the most divergent studies regarding the euglossine fauna they generally had different methodologies and/or were conducted in geographically distant locations, and/or sampled were realized in biomes great length and size.

S05.OC.01

Species, landscape and ecosystem services, why we need an integrative approach: the spatial strategy for biodiversity conservation and restoration of the Brazilian Atlantic Forest.

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Historically, biodiversity conservation strategies focus on species level. But criticism regarding the scarcity of species data defend a prevalent use of land use and land type data in conservation planning process. The vast majority of Brazilian Atlantic Forest biodiversity is still poorly known, except for terrestrial vertebrates and plants, at the same time, native land cover is small, scattered and shrinking. Besides species and ecosystems conservation, Atlantic Forest remnants provide ecosystem services for the resident population of 120 million people and some other millions of visitors and entrepreneurs. In this scenario, maintain and improve landscape connectivity is the only chance to conserve biodiversity and ecosystem services in the long term. The Brazilian Ministry of Environment is working with universities, NGOs and the german development agency – GIZ to develop a spatial strategy focused on the identification of remnants and landscapes where conservation and restoration actions are strategically needed to maintain species, landscape connectivity and ecological processes, identifying (1) sites for species conservation, integrating previous initiatives based mostly on threatened and endemic species; (2) landscape connectivity, identifying areas for habitat restoration to enhance landscape connectivity; (3) potential and effective forest biomass; (4) eligible areas for restoration projects under voluntary carbon credits; and (5) areas for the maintenance and enhancement of water provision. This strategy aims to congregate efforts from different actors supporting biodiversity and ecosystems services conservation and restoration. Preliminary results have been used in decision making process to guide federal efforts coupling nature conservation and economic development. Final results will be used to the definition of targets and goals in the revision of the Priority Areas for Conservation, Sustainable Use and Benefits Sharing of the Brazilian Biodiversity, in accordance with the Convention on Biological Diversity.

S05.OC.02

Methodological framework to optimize restoration efforts based on landscape connectivity and resilience

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Ecological restoration of degraded areas is an expensive task, and results in a variety of levels of biodiversity recovery and ecosystem services. Due to the large extent of degraded lands, the environmental constrains for biodiversity recovery and the limited financial support available, there is an urgent need to establish strategies to prioritize areas in order to optimize restoration efforts and to achieve the expected results. Landscape context has been recognized as one of the main constraints for successful restoration actions and has great influence on recolonization dynamics, but is usually not considered in these selection procedures. Here we present a methodological framework to define priority restoration areas considering landscape resilience and connectivity in multiple scales. The main goal is to enhance connectivity acting preferentially in areas of intermediate resilience, which may lead to the optimization of restoration efforts by reducing its costs and improving the potential benefit for biodiversity conservation in fragmented landscapes. We conducted a detailed analyzes of the entire Brazilian Atlantic Forest, which encompass an area of around 150 millions of hectares, and is one of the top world's biodiversity hotspots, with only 12% of the original habitat covered by forests. Our results showed that 85% of the Atlantic Forest region presents low resilience and only 5% are potential biodiversity sources. We identified 10% of the Atlantic Forest region as of high resilience areas, suggesting that there is approximately 15 million hectares of non habitat located in high resilience landscapes that might be good candidates for restoration by autogenic processes. This is the first time that landscape context is systematically employed to select areas for restoration based on landscape resilience and connectivity in such a broad extent, and we argue that this method should be employed in other regions in order to optimize restoration efforts.

S05.OC.03

Collapse of the medium and large-sized mammals of the mega-fragmented north-eastern Atlantic forest of Brazil

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We determined the conservation status of the medium-sized and large mammals, and the impact of 500 years of forest fragmentation on them; tested if the nestedness theory applies to this old highly-fragmented landscape, and predicted the future of this hotspot's hotspot. We carried out line transect surveys in 33 forest fragments, and calculated their abundance. We run a Generalized Linear Model (Factorial ANCOVA) to analyse to what extent the vegetation type, area of the fragment, isolation, sampling effort, or higher-order interactions predicted (a) richness and (b) sighting rates. In order to determine if the distribution of the species within the forest fragments exhibited a nested pattern we used both the NODF metric and the Nestedness Temperature Calculator. Subsequently, we examined the relationship of the nestedness ranking with the ranking of fragment area, isolation and survey effort using Spearman Rank Order Correlations.Out of 38 medium-sized and large mammal species occurring formerly, only 53.8% (n=21) were sighted. No fragment held the entire remaining mammal community, and only four species (19%) occurred in the very small fragments. The mammalian community was highly simplified, with all large mammals regionally extinct. Neither species richness nor sighting rates were controlled by vegetation type, area of the fragment, isolation or any higher-order interactions. Although presenting a highly-significant nested subset pattern, it was not related to the ranking of area of the forest fragment, isolation, or effort. Half of the studied mammals are extinct. The remaining medium-sized mammal community is highly simplified. Richness and sighting rates per forest fragment varied stochastically without any effect of the area of the fragment or vegetation type. Although the mammal distribution conforms to the principle of nested subsets, this nestedness was not related to the size of the forest fragment, isolation or the effort ranking. Our results suggest that the 21st century medium-sized mammalian fauna of this region will comprise only four species, unless bottom-up strict conservation measures are implemented.

S05.OC.04

Carbon storage capacity of a fragmented landscape in the Atlantic Forest Dominion of Rio de Janeiro and its implications for future landscape management and conservation.

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As tropical forests are large reservoirs of carbon and most of the carbon stock of the Atlantic Forest of Brazil was removed in the last 150 years, present and potential future carbon stocks of the Atlantic Forest are relevant to global carbon budgets. Although the efforts of improving the estimations for the current and future carbon storage capacity of this disturbed forest region have increased over the last decade, there is still a need for detailed information for many regions of this landscape. Within the framework of the interdisciplinary Brazilian-German research project DINARIO that addresses the actual causes and processes of landscape change and degradation in the Atlantic Forest region of Rio de Janeiro, we estimated the above- and belowground carbon stocks of forests within a 1640km² watershed to support the development of strategies for climate change mitigation and nature conservation at a local level.
The woody plant community in forest fragments of varying succession stages and different size classes was censused from DBH dbh≥5cm in 50 PCQ-transects. The census in continuous forest has been carried out in 115 plots along an altitudinal gradient of 2000m. Estimates of above and below ground tree biomass were calculated using allometric equations adapted for the Atlantic Forest and for specific taxonomic groups of woody vegetation. Very early stages of woody plant succession have been sampled destructively and dry AGB was measured directly. Additionally, we measured soil organic carbon up to 30cm depth using the wet combustion method and bulk density. The forest fragments at medium/advanced succession store about 55% (137.8±25.9 $Mgha^{-1}$) of the mature continuous forests total carbon stock (251.5±76.9 $Mgha^{-1}$) of the same altitudinal level (submontane, 50-500m a.s.l.). Initial and young secondary vegetations' contribution to carbon storage is at 74.5±12.0 $Mgha^{-1}$. As biomass carbon is the decisive factor for the landscape's carbon storage capacity (soil carbon fragmented area: 32.5±3.0 $Mgha^{-1}$; soil carbon continuous submontane forest: 48.6±26.4 $Mgha^{-1}$), a geostatistical analysis of degraded areas and abandoned pastures revealed an remarkable potential for future carbon storage when transformed into forest succession and afforestations. When applied to corridor concepts, this landscape transformation can additionally strongly support local nature conservation efforts.

S05.OC.05

The control of the invasive jackfruit tree (Moraceae) at Ilha Grande and its effects in small mammal community and seed dispersal.

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Jackfruit, *Artocarpus heterophyllus* is an invasive species originated from Southeast Asia and introduced in Brazil during the 18th century. Its presence is outstanding in northeastern and southeastern Brazil. Since 2006, we have studied the effect of jackfruits in small mammal communities and in seed dispersal at Ilha Grande, RJ, Brazil. Mammals were caught in traps in 18 grids with different densities of jackfruit trees. Feces of the animals were collected and the seed frequency calculated. In 2009, we began to control jackfruit trees in the study area by using both a mechanical method of girdling and a chemical method, which consists of injecting herbicide into the trunk. After 60 and 150 days of initial treatment, the number of dead trees was greater in those treated chemically. After two years, the production of jackfruit trees chemically treated was not different from that before the treatment ($t=0.024$; $p=0.981$) and was marginally different from those treated mechanically ($t=2.446$; $p=0.071$). The small mammal community differed among grids with different jackfruit densities ($F=7.018$; $P=0,017$), before the jackfruit control. However, after the jackfruit control, the small mammal community did not differ among the grids ($F=2.491$; $p=0.134$). The dispersion seed network before the treatment was composed by seven species of mammals and 28 seed species, with 46 interactions and a connectance of 0.235. After the jackfruit control, the composition of dispersion seed network decreased to three species of mammals and 12 species of seeds, with 20 interactions and a connectance of 0.308.Presence of jackfruit has consistently changed the small mammal community and negatively affected their role in the dispersal of native plant species. Chemical method seems to be more advantageous in terms of costs, but the mechanical method seems to have greater effect in the long run.

S05.OC.06

Integrating initiatives for biodiversity conservation in the Brazilian Atlantic Forest.

Paglia AP

The Atlantic rainforest holds one of the most diverse and threatened biota of the planet. About 60% of 627 animal taxa formally listed as threatened in Brazil occur in the biome. The exercises of identifying priority areas select regions with higher levels of endemism, richness and threat and were carried out in the Atlantic from the 1990s using the classical methodology of prioritization workshops. More recently, the method of Systematic Conservation Planning was applied to the definition of the official Priority Areas in the Brazilian Biomes. In the second half of the 2000s some initiatives such as Key Biodiversity Areas (KBAs), Important Bird Areas (IBAs), Brazilian Alliance for Zero Extinction (BAZE) and some Priorities Initiatives in state level, used fine-scale methods in order to identifying forest remnants that would be most important for biodiversity conservation in Atlantic Forest. It would be possible to integrate the results of all these initiatives? The simple overlay of maps is not appropriate since these initiatives were performed in different spatial scales, using different methodologies and with an extremely varied set of information. An integrated approach should perform a Gap Analysis of the current network of Protected Areas in different geographical units (Ecoregions, Biodiversity Corridors and Priority Areas) and the subsequent selection of priority forest fragments indicated in the different exercises performed at finer scale. After selection, the priority fragments must be categorized using the information of threat and irreplaceability. The final product is a map of forest remnants wich are priorities for creation of Protected Area in each Ecoregion, Biodiversity Corridor and Priority Area in Atlantic Forest.

S05.OC.07

Effect of the width of riparian reforestation strips on the ecological restoration

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Ecological restoration is a key process in the recovery of the integrity of degraded ecosystems. However, one of the main curbs of that recovery is the width of the reforestation strips, due to the intensified edge effects in long, narrow riparian sites. Thus, the goal of this study is to identify the influence of the width of stands of native species reforestations on the microclimate, biodiversity and forest structure. Eleven reforestation strips were selected, with different widths (10 to 120 meters) and ranging from 8 to 10 years of implementation; at the center of each strip, 5 plots of 10x10m (100m²) were established, adding up to 55 sampled plots (5500m²); in each plot, air temperature and humidity, basal area, woody species richness and abundance, herbaceous cover and canopy openness were recorded. The results show that, the wider the reforestation strip, the larger the basal area of planted individuals. However, there was no significant differences among the sites for canopy openness, herbaceous cover, abundance and richness of planted individuals, non-pioneer regenerants and regenerants with zoochoric dispersion. Canopy openness showed a positive relationship with the herbaceous cover and daily thermal range and a negative relationship with minimum humidity. It is concluded that, for most of the analyzed variables in 8-10-year-old reforestations, the width of the strip is not exerting a strong influence, possibly because the sampled sites still do not show a closed canopy structure, able to induce expressive changes on the microclimate and, consequently, on the biodiversity. Despite the herbaceous cover, thermal range and minimum humidity comply with the canopy variations, these variations are evenly spread along the strips, regardless of width.

S05.OC.08

Responses of a rainforest refugia to climate variability, the case of the Atlantic rainforest of Ceara, Brazil

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The Atlantic forest was fully developed in northeastern Brazil between 17 and 13 kyr ago, and disappeared at the beginning of the interglacial (The Holocene) when it became restricted to the reliefs. Today they form modern refugia in the middle of the dry deciduous forest (Caatinga). The observation of the responses and behavior of such forest refugia under warming conditions is important to understand the role of a refugia in policing the tropical biodiversity. Long term observations are needed to understand the species turn over, the resilience and establish the range of responses to climatic changes. In this aim, we cored a marsh located on the top of a refugia at Maranguape (3° 53,672'S; 38° 43,226' W; alt 900 m). The age model of this core is based on 7 radiocarbon dates and the sediment composition and deposition illustrate several changes during the last 5000 years. Pollen analysis of the sediment was performed with a resolution of ~30 yr / sample and show four different phases of vegetation with two drastic climatic episodes: (i) at 4500 cal yr BP and (ii) between 4000 and 3000 cal yr BP. They both induced significant changes in the forest composition and diversity with for instance the development of some heliophilous taxa such as *Alchornea* and *Gallesia*. During the last millennium a progressive increase of the Asteraceae was observed. These changes are related with strengthening of the ENSO and changes in the seasonal shifts of the ITCZ, respectively linked to equatorial Pacific Ocean and tropical Atlantic Ocean sea surface temperature anomalies.

S05.OC.09

Effects of recent climate change over the structure of bird communities in the Brazilian Atlantic forest.

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The effects of climate changes over biodiversity have been an important challenge on conservation. One of the tools to minimize those effects is to re-build the levels of susceptibility of biota to climate changes in the recent past, as during Quaternary. There are three types of forests in the Brazilian Atlantic rain forest: seasonal semi-deciduous forest (SF), dense rain forest (DF), and mixed rain forest (MF). MF, associated to colder climate, is being replaced by both SF and DF, due climate changes since Quaternary. We investigated which changes occur on bird diversity and composition in those forests based in two years bird census in 15 different localities. The 269 recorded bird species were classified in five general groups of feeding habits: nectarivores, frugivores, insectivores, omnivores, and carnivores. The structures of bird communities were quite similar in species number among the forests but they were strongly different when the relative abundances of the species are considered. Since vegetation changes more slowly than do climate, we suggest that the climate of Quaternary favored the increase of relative abundances of insectivorous birds at the northern portion of MF. SF has a characteristic dry period and its temperature is relatively high during the year, therefore assimilating those conditions to the predictable effects of recent climate change. In SF omnivores had their highest relative abundance. We predict that recent climate change could increase the abundances of omnivores in both DF and MF, what would depress specialized birds, as frugivores and some insectivores. We argue that the synergetic effect of the lower population of DF birds and the higher competition with omnivores, beside high rates of forest fragmentation, could increase the potential of local extinction DF. In MF, in turn, bird species that now-a-days are not threatened could become vulnerable in the future.

S05.OC.10

Diet overlap between rodents and marsupials in four Atlantic forest areas

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Niche overlap among sympatric species encompasses multi dimensions. Food is one of the most important aspects of niche and it seems reasonable to assume that the structure of a community is based mostly on the way that this resource is used among coexisting species. We used stable isotopes ^{15}N and ^{13}C to investigate diet overlap between sympatric species of rodents and marsupials in four areas of Atlantic forest in the state of São Paulo. Two areas (Santa Virgínia and Vargem Grande) are located in the Serra do Mar massif. The third area Carlos Botelho State Park is located in the Paranapiacaba massif, and the last one, Cardoso Island is located in the south of São Paulo state. We set up 0.6-ha grids in each study site with traps on the ground to sample small mammal community at these areas. We got fur samples from all individuals captured. At the same time, we collected food resources that were available in the study area. An ellipse of 95% of confidence was made to bond the isotopic space of rodents, marsupials and resources. Our results revealed that marsupials had a narrow diet based on animal prey. In contrast rodents' diet was wider with some species eating more plants and seeds while others also consuming animal prey. Rodents seem to have a more generalist diet whereas marsupials are more specialists. Nevertheless the marsupials' isotopic space is included within rodents' isotopic space, suggesting competition for food resources among them.

S05.OC.11

Variation in the partitioning of carbon above and belowground in the Brazilian coastal Atlantic forest elevation gradient

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We characterize the spatial trends in carbon storage in both above and below ground biomass along an elevation gradient in Atlantic Forest sites located on the steep slopes of the Serra do Mar on the north coast of the State of São Paulo, southeast Brazil. We used radiocarbon isotope to investigate the role of soil clay content in the dynamics of soil carbon. We assessed tree biomass, coarse woody debris stocks, litter layer and carbon storage in the soil based 1ha plots distributed across the gradient of elevation. Carbon concentration in each compartment were determined and used to convert biomass into carbon stocks. The carbon stock varied along the elevation range from approximately 100 to 150 Mg ha^{-1} in aboveground and 90–300 Mg ha^{-1} in belowground. Radiocarbon measured in bulk soil organic matter decrease rapidly from positive values (indicating the predominance of carbon fixed since the 1960s) near the surface to large negative values (indicating that radiocarbon has resided in the soil long enough for significant radioactive decay to occur). The soil in sea level differs markedly from the other soils and $D^{14}C$ values in this soil are positive, indicating relatively recent origin of the organic matter sampled in this soil. Finally, the total carbon stock varied from approximately 180 to 460 Mg ha^{-1}. Most of the carbon stock was found belowground and not aboveground as normally found in lowland tropical forests. The total stock of carbon increased significantly with elevation. As the soil and air temperature also decreased significantly with elevation, we found a significantly inverse relationship between carbon stock and temperature. Using this inverse relationship, we made a first approach estimate that an increase of 1◦C in soil temperature would decrease the carbon stock in approximately 17 C Mg ha^{-1}.

S05.OC.12

Phylogenetic links among forest types in the Southern Brazilian Atlantic rainforest complex

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Brazilian Atlantic rainforests shelter astonishing plant diversity and are distributed across a large geographical range. Their historical development is complex in time and space, generating distinct physiognomies. Nonetheless, it is generally assumed that Brazilian Atlantic rainforests are all part of a single biome. We analyzed the phylogenetic links between three different Southern Brazilian Atlantic rainforest types: Mixed, dense and seasonal forests. We compiled information from 206 floristic checklists describing the occurrence of shrub/tree species across biome range. Species occurrence in each plot was weighted according to increasing levels of phylogenetic depth among species (genera, family and higher clades). For this, we employed phylogenetic fuzzy weighting. We compared forest types in relation to 1) Rao entropy and 2) phylogenetic composition, at different degrees of phylogenetic depth using ANOVA. Furthermore, we employed indicator species analysis to identify species, genera, families and higher clades related to each forest type. Forest types did not differ in relation to species, genera and family entropy; nonetheless, mixed forests and seasonal forests showed, respectively, highest and lowest phylogenetic entropy levels. Phylogenetic composition varied between all forest types, independently of phylogenetic depth. Nonetheless, F-values for contrasts comparing mixed forests with other types increased with phylogenetic depth. Mixed forests and seasonal forests showed, respectively, the highest and the lowest number of indicator species, genera and families. Higher phylogenetic diversity in mixed forests likely results from the occurrence of a higher number of taxa from basal clades in relation to other forest types. Although dense forests are often seen as diversity hotspots, our results suggest that mixed forests can shelter even higher phylogenetic diversity than dense forests, and should be also considered as a biodiversity hotspot. Rather than a single biome, Atlantic rainforests might be better seen as a complex of phytogeographically distinct biomes, with particular evolutionary features.

S05.OC.13

Phylogenetic habitat filtering and phylogenetic structure across a successional gradient in Atlantic Rainforest

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Atlantic Rainforest is known by high diversity of sympatric species and fast recovery rate after disturbance. Succession includes species turnover mediated by plant strategies, biotic and abiotic interactions. Nonetheless, species are not mutually independent in terms of evolution. Therefore successional gradients are useful to study phylogenetic structure variation underlying species assembly at different successional stages. Phylogenetic structure of woody saplings (≥ 0.30 cm tall to 1 cm DBH) and trees (≥ 10 cm DBH) assembled into communities was analysed in four chronosequences, and , totalling 29 plots ranging from 6 to 45 years after disturbance and old-growth forests. Data were analysed using net relatedness index (NRI) and principal coordinates of phylogenetic structure (PCPS), obtained from a matrix of phylogeny-weighted species composition. Differences between successional stages were tested for NRI values and PCPS axis using ANOVA with permutation tests. Both tree and saplings communities of old-growth forests showed phylogenetic overdispersion (P= 0.05), suggesting that species interactions (like competition) may drive species assembly at that stage. Tree species assembly did not reveal differences in clades distribution (PCPS axis) across the successional gradient, but saplings did. Three PCPS axis explained most of saplings phylogenetic variation (94%) throughout the successional gradient, being the first and the third axes significantly distinct (P= 0.006, P= 0.001, respectively). These axes revealed a clumping of basal angiosperms (magnoliids) at intermediate successional stages, while for late-divergence clades (eudicots), we observed a remarkable presence of asterids at initial stages and rosids at old-growth forests. Results suggested strong biotic interactions driving community assembly as succession proceeds. On the other hand, phylogenetic habitat filtering was evident only for saplings, as showed by the patterns of plant clades in the regeneration layer throughout the successional gradient.

S05.OC.14

Different origins for functional and species diversity variation along a Southern Brazilian Atlantic rainforest tree metacommunity

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Linking biodiversity and functionality through species traits can provide great insight to ecological knowledge of biological community processes. Understanding factors that drive diversity among metacommunities is of great importance for conservation strategies. Our aim was to identify the drivers that define variation of functional and species diversity in a Southern Brazilian Atlantic rainforest tree metacommunity, located along the coast of Paraná, Santa Catarina and northeast Rio Grande do Sul states. We hypothesize that different drivers explain functional and species diversity variation within the metacommunity. Specifically, environmental variables, representing niche processes, may define functional traits along the gradient whereas species diversity should be explained by metacommunity history, represented by spatial variables. To test this we partitioned the variation of each through redundancy analyses. Space, represented by eight PCNM variables, and environment, represented by climate and topologic variables, were used as explanatory matrices. We used the species composition matrix and two functional diversity matrices as response variables. We selected explanatory variables through forward selection for each of the three response matrices. We compiled tree species composition data from 12 sites. To assess function we sampled traits that represent plant ecological strategies of 104 species. We found that different spatial scales defined species and functional diversity variation. Seasonality of both rainfall and temperature explain 13% of the species diversity variation. Functional diversity variation was not explained by environmental variables. Finer scale PCNM variables, selected as drivers of functional diversity variation, identified important regional centers of endemism that coincide with observations from early botanists based on local flora. Partitioning variation analysis applied to functional diversity variation detected finer metacommunity patterns that could not be detected with taxonomy alone. Present conservation areas along Southern Brazilian Atlantic rainforests should be maintained in order to preserve functional diversity of this tree metacommunity.

S05.OC.15

Ecohydrology of Brazilian Atlantic Cloud Forests from Southeastern Brazil

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Brazilian Atlantic Cloud Forests (BACF) are common over mountaintops in southeastern Brazil and are characterized climatically by receiving frequent fog events. These forests play an important role in the regional water cycle because of its ability to intercept and harvest significant amounts of water from orographic clouds and mist. However, little is known about the diversity of mechanisms of fog water use by the vegetation and the ecological consequences of predicted drier climates. In face of climate change (fog uplift), which will expose these forests to extreme droughts, it is important that we understand how fog influence the ecophysiology of BACF trees. In this talk, I will summarize the main results of our recent studies on the functional ecology of cloud forest species and the ecohydrology of BACFs, which addressed the following questions: Is fog an important water source for BACFs species during rainless periods? What is the ecohydrological role of frequent fog events to BACFs under a seasonal climate? How will BACF species respond to future drier climates? To address these questions, we are undertaking a number of greenhouse and field experiments using multiple methods, including stable isotopes, analysis of high resolution microclimatic data (from a station installed at 2000 m in the middle of the fog belt), monitoring of tree water use, leaf gas exchange and tree hydraulics under contrasting climatic conditions.We have found that many species can absorb fog water directly through their leaves. Fog can significantly reduce tree transpiration and contribute to increases in soil water storage. Fog water uptake might be especially important in rainless periods as it alleviates tree water stress and favours the maintenance of positive carbon balance for trees. Collectively, our results suggest that fog is a key climatic driver for the persistence of species and maintenance of important ecosystem services in BACFs.

S05.OC.16

Do density-dependent factors organize spatial tree species distribution in the Atlantic Rainforest?

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Factors organizing and maintaining species richness and their spatial distribution in tropical forests are not understood sufficiently. Non-random processes organizing species co-existence might be revealed by the phylogenetic structure of the ecological community. If environmental conditions in a habitat act as filter that select for species in possession of certain traits, we would expect to find more closely related species within communities, because such species share more evolutive history and therefore more traits that enable them to colonize the same habitat. In this case, community should be phylogenetically clustered. On the other hand, negative density dependent factors might not only act among conspecific individuals, but also between individuals from closely related species. Therefore, such factors should cause the community´s phylogenetic structure to be overdistributed. Aim of this study was to analyze the phylogenetic community structure from the Forest of Seu Nico (FSN) to test which factor, environmental filtering or negative density-dependent factors, is the most important organizing force of spatial species distribution. Within 100 continuous plots of 10x10m, all trees with diameter at breast height greater or equal to 3.2 cm were identified. All 218 tree species were inserted in the megatree R200703050.bl.new forming the aged community tree. Using the constrained null model from the phylocom package, the net relatedness index (NRI) for each plot was calculated based on the difference between the mean phylogenetic distance among all species from observed and randomized communities. Negative NRIs indicate phylogenetic overdistribution, positive values clustering. With on average -0.975 (±0.858), the tree community from the FSN presents phylogenetic overdistribution. According to a one sample t test, this value differs significantly from zero. Therefore, we conclude that negative density-dependant factors like the Connell-Janzen-hypothesis organize tree communities and maintain species richness in the megadiverse FSN. Analyses from further study sites should generalize this pattern.

S05.OC.17

Reproductive success of *Aechmea winkleri* (Bromeliaceae), an endemic endangered species of Southern Brazil

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Patterns of population fertility and mating system and their consequences for the evolution of mating systems in non-model species are poorly understood. Aechmea winkleri is a preferential terrestrial or saxicolous bromeliad species, endemic of a small region in the Southern Brazil. Populations of this species suffer from habitat fragmentation resulted from conversion of forests in urban and agricultural areas, which may be threatening to its survival and evolution. We explored the ecological and genetic factors influencing the success of reproduction and persistence of this species in nature. Our data showed that this species is self-incompatible, dependent of bees and birds for pollination and fruit set. We observed high flower, fruit and seed production, and high proportion of seed viability. The pollen supplementation experiment using manual cross- and open-pollination showed a similar means for number of seeds per fruit, showing no pollen discounting. Two years of demographic surveys revealed a high investment in vegetative reproduction. On average, there are sixteen ramets for each genet. For the mating system analysis we sampled 59 mother plants and 15 seedlings for each, totalizing 893 individuals from four areas. Based on a posterior probability analysis in Geneland, we identified two cryptic subpopulations in this species. The overall multilocus outcrossing rate was of 91.4%, characterizing an outcrossing mating system, while the biparental inbreeding was 4.5%. The number of effective pollen donors was only 1.23. The pollen pool sampled showed a moderated genetic structure ($\Phi FT=0.25$). The effective area of pollination was 19.5 m, with an average pollination distance of 49.4 m. These short pollination distances may be in consequence of habitat fragmentation and pollinator loss. Regarding the rapid ongoing fragmentation of its habitat, the results achieved will help to elucidate the directions of evolution and conservation in this species.

S05.OC.18

The ghost of spur evolution past: Match and mismatch in the pollination mechanisms of highly specialized long-spurred orchids

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Long-spurred orchids rely on highly specialized pollination mechanisms by which reproductive success is achieved through a close association with long-tongued hawkmoths. In *Habenaria* species, pollination success depends on the attachment of pollinaria onto the heads of hawkmoths with very long proboscises. However, in the Neotropical region these moths are less abundant than their shorter-tongued relatives and prone to population fluctuations that may give rise to differences in pollinator-mediated selection on floral traits through time and space. For three South American *Habenaria* species we characterized their hawkmoth assemblages and estimated phenotypic selection gradients on orchid spur lengths. We examined the match between pollinator proboscis and flower spur lengths to determine whether actual pollinators may act as selective agents on flower morphology. The orchid species studied are terrestrial herbs growing generally in grasslands with swampy soils and on the margins of streams and ponds. *Habenaria gourlieana* population was studied at El Durazno, Córdoba – Argentina, while *H. johannensis* and *H. paulistana* populations were studied at the Atlantic Rain Forest in the São Paulo state, Southeastern Brazil. The three species develop long inflorescences with a variable number of large flowers (3 up to 30), which are greenish-white in color, emit scent after dusk and spurs can reach until 16 cm. We found significant directional selection on spur length only in the Argentinian population, where most pollinators had proboscises longer than the mean of orchid spur length. The two Atlantic Rain Forest populations had a strong spur-proboscis mismatch, where pollinators had proboscises shorter than the mean of the spur lengths of both orchid species. Since phenotypic selection is dependent on the mutual match between pollinator and flower morphologies, our findings indicate that pollinator-mediated selection may vary through time and space according to local variations in pollinator assemblages.

S05.P.01

Exotic Invasive Plants on Forest Restoration in Atlantic Forest, Brazil

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Exotic invasive species are the second greatest cause of biodiversity loss in the world. In forest restoration, these invaders can cause serious problems, like the suppression or exclusion of plants through competition and changes in the environment. Among these species, tropical invasive grasses are responsible for heavy costs and contribute to several setbacks. Given these issues, this study aimed to evaluate the effects of preexistent nonnative species on forest restoration in semideciduous Atlantic Forest. To check for the effect of invasive plants, we installed 120 plots (10x10m), divided into 12 native species reforestation sites aged from 40 to 89 months. Four subplots (1m²) per plot were installed to estimate herb dry biomass. Grass abundance declined with age of the sites (n=12; β=-0,61; p=0,03; r^2=0,37) and with the percentage of planted pioneer trees (Spearman, r=-0,61). Abundance and biomass of non-grass ruderal species showed a positive relationship with canopy openness (n=12; β=0,58; p=0,04; r^2=0,34 e n=12; β=0,57; p=0,05; r^2=0,33 respectively). Soil fertility and grass biomass were positively related, markedly due to K^+ concentration (Spearman, r=0,60) and grasses abundance increased with the P concentration (Spearman, r=0,62). Grass abundance declined with age of the areas, but grass biomass was not explained nor by age or by canopy openness. This lack of response to progressive shading under reforestations is stronger for *Panicum maximum* Jacq. (guinea grass). Furthermore, both the abundance and biomass of *P. maximum* showed negative effect on the native species abundance in the understory (n=12; β= -0,63; p=0,02; r^2=0,40 and n=12; β= -0,74; p=0,005; r^2=0,55). Our results suggest that, while some grasses show strong detrimental effects on the regeneration, non-grass ruderal species are not necessarily a concern.

Key-words: Alien Species, canopy openness, soil fertility, *Panicum maximum*.

S05.P.02

Effect of resource addition on cricket diversity: Disentangling local passive sampling from environmental biodiversity drivers

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A research area in ecology receiving increasing attention is evaluation of the environmental drivers of biodiversity through correlation with potentially causative variables, so as to understand regulatory mechanisms and enable the development of conservation management measures. This approach can, however, confound local passive sampling effects with direct effects of the tested environmental variable on diversity. Here we propose an analytical approach that disentangles local passive sampling effects from the direct effects of environmental drivers on diversity. We propose to include accumulated abundance per sampling unit and an interaction term, as co-variables in the statistical models used to explain diversity. Significant effects of abundance on diversity would correspond to local passive sampling effect, in which samples that captured more individuals would represent a larger proportion of the available species pool. We detected local sampling effects revealing previously hidden environmental effects. We therefore suggest that the local passive sampling should be treated as the biological neutral hypothesis for analyses explaining drivers of biodiversity. Furthermore, we suggest that significant effects of environmental drivers are necessary to unveil emergent properties of these biological communities, that arise when individual components in an environment come together to create distinct, collective and interactive properties and functions. We suggest that the analytical approach outlined here is essential for all studies of environmental drivers of biodiversity. The theoretical and biological mechanisms that generate the detected patterns deserve further investigation.

S05.P.03

Evolution and Diversification of *Ortgiesia* (*Aechmea*, Bromeliaceae) in Southern Brazilian Atlantic Rainforest

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Ortgiesia subgenus comprises 22 species, most of them endemic to Brazil with only two species occurring also in Argentina, Uruguay and Paraguay. These species display taxonomic uncertainties, with no clear criteria for delimiting species boundaries. Besides, in many cases species overlap flowering period and geographic distribution. The objective of this study was to investigate the evolutionary processes responsible for the diversification of *Ortgiesia* species endemic to southern Brazilian Atlantic rainforest. Specifically, we aim here to understand how the historical demographic processes shaped the genetic diversity of wild populations; and identify refugia areas and contact zones, possibly associated to past climatic oscillations during Pleistocene. Genetic diversity and phylogeographic patterns were addressed by using nuclear and chloroplast molecular markers. At present 11 nuclear microsatellites markers were used to genotype a total of 144 individuals from five populations across the whole geographic range of *Aechmea calyculata*, the only species from this group that presents an East-West pattern of geographical distribution. This species presents high genetic diversity with up to 13 alleles per loci and observed and expected heterozygosities ranging from 0.291 to 0.629 and from 0.477 to 0.695, respectively. Restricted gene flow among populations were observed (F_{ST} = 0.24), and the within-population inbreeding coefficient was significantly positive (F_{IS} = + 0.049). The conservation and evolutionary implications of the observed patterns of genetic variability will be discussed.

S05.P.04

Isolation and Characterization of Nuclear Microsatellite Loci for *Aechmea caudata* (Bromeliaceae) a Species from Brazilian Atlantic Rainforest

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Aechmea caudata (Lindm.) is an endemic species that growth preferentially on rocks in the coastal region of southeastern Brazil. Few small populations of this species are currently found and are seriously threatened by habitat loss and fragmentation. Microsatellites have become the most used DNA marker in population genetics and conservation studies. Even in small and endangered bromeliad species these markers have shown high degree of polymorphism. The objective of this study was to develop the first set of polymorphic microsatellite markers for the genus *Aechmea*. The markers developed will be used to describe genetic diversity and structure of *A. caudata*. Total genomic DNA was extracted from leaves of *A. caudata* and the markers isolation involved construction of a genomic library enriched for $(CT)_n$ and $(GT)_n$ repeats, based on the biotinylated oligonucleotide sequences bound to streptavidin-coated magnetic particles. Microsatellite-enriched DNA fragments were ligated into pGEM-T Easy vector to transform *Escherichia coli*. A total of 96 recombinant colonies were obtained and sequenced. For 17 clones containing microsatellite motifs, forward and reverse sequences were aligned in DNASTAR and primers were designed for 14 loci using the primer 3 online program. An initial screening was done and 11 out of the 14 primers amplified in *A. caudata*. A total of twenty four individuals from a single population of *A. caudata* (Florianópolis, SC, Brazil) were selected to the evaluation of SSR polymorphism, which are in progress. All the variable markers will be tested for cross-amplification in at least 20 different species of Bromeliaceae family.

S05.P.05

Species diversity and distribution pattern of Begoniaceae along an altitudinal gradient in the Serra dos Órgãos, RJ, Brazil

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Within the project DINARIO (Climate change, landscape dynamics, land use and natural resources in the Atlantic Forest of Rio de Janeiro) we studied the floristic differentiation and the diversity of Begoniaceae along abiotic gradients.

The study was carried out in the submontane, montane and high montane forest of the Atlantic Rain Forest in the Serra dos Órgãos in three different, but connected nature reserves: the Parque Nacional da Serra dos Órgãos (PARNASO), the Parque Estadual dos Três Picos (PETP) and the Estação Ecológica Estadual do Paraíso (EEEP). In this study area the flora of the Begoniaceae was characterised along an altitudinal gradient (200 to 2100 m a.s.l.) within 114 sample sites (each 100 m²). Within the sample sites all terrestrial individuals were registered as well as trunk epiphytes, growing up to a height of two meters above ground. Additionally to the species data for all Begoniaceae (cover-abundance, life form) we documented topographic data, soil parameters, light conditions (using hemispherical photographs) and supplementary information about the surrounding vegetation.

In all forest types and altitudes *Begonia* species are typical, but not always an integral part of the forest vegetation. In total we found 32 (38 %) of 85 *Begonia* species known from the state of Rio de Janeiro. Several of the most important terrestrial species show clear preferences to different forest types. *Begonia hookeriana* is particularly typical for lower elevations in the submontane forest up to about 700m a.s.l. In the montane forest at mid elevation *Begonia arborescens* and *Begonia bidentata* are predominant. *Begonia angulata* is common in the high montane forest.

This study is the first study about the species diversity and distribution pattern of the Begoniaceae in the Atlantic Rain Forest. The results are important for a better understanding of plant diversity and its conservation in tropical ecosystems.

S05.P.06

Altered species composition and diversity in fragments of the Atlantic Rainforest of Rio de Janeiro, Brazil

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We analyzed effects of forest fragmentation on diversity and composition of tree species communities in the ombrophilous submontane forest at the foothills of the Serra dos Órgãos in the state of Rio de Janeiro. A floristic survey of the tree community was carried out in nine forest fragments of varying size (ranging from 5 ha to 130 ha) and one mature continuous forest using the point-centered quarter method. In each study site 220 trees with dbh ≥ 5 cm were sampled, identified to species level and grouped into Pioneer and Non-Pioneer species sensu Lima (2010). Data analysis was done per study site for species diversity and composition. In order to detect impacts of edge effects on species composition in the fragments we classified the 495 points based on their distance from the edges.

The sampled 2.200 trees comprised 299 species within 176 genera and 59 families. The level of endemism was high in the mature forest (47 %). In contrast, only 21 % to 35 % of the species sampled in the fragments are endemic to the Atlantic Rainforest of Brazil. Species diversity of order 1 sensu Jost (2006) of the largest fragment was comparable to that of the continuous forest (effective species: 52 and 53 respectively), meanwhile species diversity of the other fragments was lower (22 to 45). All fragments showed a low floristic similarity to the mature forest with a Horn-Morisita Index of dissimilarity between 0.78 and 0.99. The overall proportion of Pioneer species was about 40 % (mean) in the fragments and 17 % in the mature forest. We found a clear correlation between relative abundance of Pioneer species and adjacency to forest edges.

Our results are indicating clear effects of forest fragmentation on diversity and composition of tree species communities (edge effects).

S05.P.07

Survival of native tree seedlings planted in the recovery of a riparian vegetation stretch of Pandeiros river, north of Minas Gerais State, Brazil

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The intense fragmentation and destruction of riparian vegetation compromise the watercourses and the water quality. Even protected by law, the riparian forests have been highly impacted in Brazil, requiring urgency in the recovery of this vegetation. This study evaluates the success of planting in the riparian vegetation recovery of an area impacted by cattle from the Environmental Protection Area of Pandeiros river (Januária, Minas Gerais State, Brazil), by assessing the survival of planted seedlings. The monitoring was conducted from January to October/2010 after the planting of 3,465 native species seedlings, belonging to 16 species and eight botanical families, in an experiment with four plots of 1 ha (50 m x 200 m), isolated from cattle, ploughed and fertilized with organic matter. The four treatments consisted of seedlings planting in two distances between rows (2 and 4 m), with presence or absence of direct sowing (S), referred to as T2, ST2, ST4 and T4. The overall survival of seedlings was high (64.0%), from which the treatment with higher survival percentage was T4 (80.05%), followed by ST2 (73.29%), ST4 (65.83%) and T2 (37.59%). Probably the low survival in T2 is due to the periodic flooding in this plot, which may explain the higher survival of plants tolerant of excessively wet conditions, such as *Cecropia pachystachya* Trécul (43.75% in total, 60.51% in T2). Species from dry environments, such as *Myracrodruon urundeuva* Allemão (82.72%), *Astronium fraxinifolium* Schott ex Spreng (79.66%) and *Anadenanthera colubrina* (Vell.) Brenan (78.88%) presented high survival percentages in all plots, what may indicate a better adaptation of these species to disturbed environments, therefore being recommended for planting in the recovery of degraded areas. It can be concluded that there was success in planting, through the high survival percentage of the species, except for the plot T2, which has suffered flooding.

Support: CNPq (577460/ 2008-0); CAPES, FAPEMIG, IEF e UNIMONTES

S05.P.08

Establishment of Cecropia pachystachya Trécul (Cecropiaceae) seedlings implanted in the recovery of the riparian vegetation of Pandeiros river, north of Minas Gerais State, Brazil.

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The riparian vegetation is associated with waterways and play a key role in the maintenance of the watershed functions. *Cecropia pachystachya* Trec. (Cecropiaceae), known as embaúba, is a pioneer tree typical of wet soils. This study evaluated the survival and growth of *Cecropia pachystachya* implanted in different recovery models of the riparian vegetation impacted by cattle in Pandeiros river (Januária, Minas Gerais State, Brazil) from January to October/2010 in four plots of 1 ha (50 m x 200 m), which were isolated from cattle, ploughed and fertilized. Four treatments were implanted consisting of seedling planting with distances between rows of 2 and 4 m, with presence or absence of direct sowing (S), referred to as T2, ST2, T4 and T4S. We measured height and diameter at the base of the stem (DBS) of the 432 sampled individuals. The percentage of seedling survival was calculated, and to determine variations in the growth of the species among models we used Analysis of Variance. The survival percentage was 43.75%, being highly variable among the recovery models (ST4 = 15.68%; ST2 = 39.55%; T2 = 60.51%; and T4 = 19.23%). The growth in diameter ($gl = 3$, $F = 3{,}79$, $p > 0{,}05$) and height ($gl = 3$, $F = 2{,}28$, $p > 0{,}05$) did not vary significantly among treatments. The high survival of *C. pachystachya* from T2 plot may be related to the preference of this species to wetlands, since this plot suffers periodic flooding. In the other hand, the low survival of the species in the other plots is probably related to drier environmental conditions, where species such as *Myracrodruon urundeuva* Allemão showed better survival. It is concluded that despite the growth of the species does not differ between treatments, the survival percentage varied, showing better adaption of the species to humid environments.

Support: CNPq (577460/ 2008-0); FAPEMIG, CAPES, IEF e UNIMONTES

S05.P.09

Patterns of hybridization between two sympatric species of bromeliads from Brazilian Atlantic Rainforest: evolutionary and conservation implications

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Hybridization is a powerful evolutionary force that creates opportunities for adaptive evolution and speciation. Natural hybridization between sympatric species provides a valuable tool to study the evolution of reproductive isolating barriers. *Vriesea carinata* and *V. incurvata* are two bromeliad species with high ornamental appeal, suffering impacts with the illegal extraction. These bromeliads show a sequential flowering along the year, with a short period of flowering overlap, and share the same floral visitor, both were pollinated by hummingbirds. The aim of our study is to evaluate the inter-specific flow gene and genetic structure of *V. carinata* and *V. incurvata,* in addition to estimate the frequency of genetic mixing to understand the evolutionary patterns and to identify events of introgression. To evaluate the pattern of inter-specific gene flow it was sampled three sympatric populations of *V. carinata* and *V. incurvata*, and two allopatric populations of each parental in order to obtain a pure molecular profile. At present, fifteen nuclear microsatellite loci were used to genotype 108 individual from one sympatric population to evaluate what is the genomic composition of the putative hybrids. Nineteen hybrids were identified and they presented intermediate observed and expected heterozygosities compared to parental (H_O = 0.585 and H_E = 0.737). *V. carinata* showed H_O = 0.527 and H_E = 0.702, and *V. incurvata* presented H_O = 0.449 and H_E = 0.585, respectively. The data obtained will help to elucidate the evolutionary aspects of the reproductive system and reproductive isolating barriers pre-and post-zygotic which are acting for the maintenance of species cohesion. Also it will be possible to evaluate the degree of mixture genetic and infer whether this share is ancestral or contemporary. The results will also help to design strategies for species conservation.

S05.P.10

WHAT THE VALUE OF SECONDARY FORESTS AND PLANTATIONS ON THE CONSERVATION OF UNDERSTORY BIRDS IN THE ATLANTIC FOREST?

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We evaluated the potential of the understory birds to occupy secondary forests and *Araucaria* plantations using point counts. One area of pristine forest (P), two of secondary forest (S1, S2), and two of *Araucaria* plantations (R1, R2) were sampled at southern Brazil from September-November of 2010 and from February-March 2011. An index on potential of occupancy (PO) of disturbed areas was developed, based in the relative abundance and, it was calculated for each bird species. 124 bird species were recorded in total. The highest richness was found in P (100 species). 72% of the species recorded in P was also found in the other studied disturbed forests (67 in S1, 57 in S2, 69 in R1, and 64 in R2). All bird guilds were affected in disturbed areas ($p < 0.05$) except the climber-insectivores ($p > 0.05$). The terrestrial-insectivores were exclusive of pristine forest. The potential of occupancy of the studied disturbed areas varied among the species. We considered that, in general, 27 species had high PO, 14 had intermediate values of PO, 32 had low PO, and 28 had restricted PO. 32 species had similar PO for both secondary forests and *Araucaria* plantations but 40 species had different values. Species which are common ($G = 0.38$, $p = 0.008$), with lower sensitivity to fragmentation ($G = 0.36$, $p = 0.01$) and, that use more than three forest types ($G = 0.35$, $p = 0.02$) make up the species profile with higher potential to occupy disturbed forests. Both secondary forests and *Araucaria* plantations may be an useful tool to increase connectivity in fragmented areas for many bird species. However, we pointed out that several species could be considered habitat specialist of pristine forest and for them those disturbed habitats are not useful.

S05.P.11

Quantitative measures of fog interception using Sphagnum spp.

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Abstract: Cloud forests are often covered by clouds or fog, and receive additional moisture through the condensation of water droplets (known as horizontal precipitation). This study aimed to quantify the interception of fog using biological collectors in a cloud forestin the *Serra da Mantiqueira* mountain range, Minas Gerais. Mosses from the Sphagnum spp. genus were used, which are typical of moist and high elevation areas. The experiment was set across an altitudinal gradient: 1500, 1700, 1900, and 2100 m.s.l. The moss samples were oven-dried and the dry weight was obtained for each sample with a precision scale. In each elevation, 10 oven-dried moss samples were analyzed per day, during seven days in September and three days in January. The samples were collected and weighed between 5:30 and 6:30 am, to determine the moisture content. The results showed that there was no linear relationship between the increase in elevation and the interception of moisture by the moss samples. At 1500 m.s.l the mosses presented the lowest amount of intercepted moisture (13%), while the average water content obtained at other elevations presented higher values, ranging from 17 to 18 %. Difference between the studied months was also observed, where the average moisture measured during September was higher than in January. This fact was due to the presence of clouds during the field week in September. This study emphasizes the importance of nonvascular epiphytes as water collectors horizontal precipitation, considering that these values were obtained during days with no rainfall. The horizontal interception represents a significant increase of the water balance within cloud forest formations, leading to an earlier water saturation of the forest environment.

S05.P.12

Cloud cover for modeling indicator species of cloud forests in the Serra da Mantiqueira.

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Abstract: The *Serra da Mantiqueira* mountain range is part of the Atlantic Forest domain that forms one of the most biodiverse and threatened ecosystems of the world. This domain includes mountain forests, which depending on site conditions can be classified as cloud forests that are frequently covered with clouds or fog. The *Drimys* genus is indicative of neotropical cloud forest and the tree species *Drimys brasiliensis* is considered to be an indicator of montane Atlantic Forest. This study aimed to model the potential distribution of *D. brasiliensis* using cloud cover data obtained from satellite images in the *Serra da Mantiqueira* region. A total of 17 geographic coordinates with the presence of the species were obtained from the TreeAtlan database. Satellite images with cloud cover above 80% were obtained from the Instituto Nacional de Pesquisas Espaciais (INPE). Eleven uncorrelated environmental variables were applied to the model: 4 LANDSAT images, one for each season; vegetation index (Evi 097, Evi 193, Evi 01); topographic index; slope; digital elevation model; and, land aspect. The collected data were analyzed using the software and algorithm MAXENT. The modelling using cloud cover confirmed the hypothesis that the potential distribution of *D. brasiliensis* is directly related to cloudiness. It also confirms that cloud cover is a strongly potential variable in predicting the incidence of other species indicators of high elevation areas. The map generated with the model showed to be very similar to the shape of the rock formation of the Serra da Mantiqueira. This study reinforced the importance of clouds to the formation of these forest types. The generated map serves to localize unknown areas of cloud forests and indicate priority areas for conservation, due to the high specificity of these environments and their vulnerability in face of global climate change.

S05.P.13

Patterns of tree turnover across an elevational gradient in the Brazilian Atlantic forest

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Understanding tree mortality and recruitment process in tropical forests is crucial as those processes ultimately influence forest structure, composition and carbon cycle. Recent studies have suggested that tree mortality and recruitment increase when terrain becomes steeper. Here we assessed tree mortality, recruitment and turnover - the rate with which tree die and recruit into a population - across an elevational gradient (50 to 1100 m a.s.l.) in the tropical Atlantic forest to test the hypothesis that tree turnover increase with slope and altitude. We tagged, mapped and measured all trees with diameter at breast height (1.30m or above any buttress) ≥ 4.8 cm in 11 one-hectare plots, and a new census was carried out after 2 years. We used as surrogate of slope the difference between the minimum and maximum elevation values within 1- ha plot (elevational range at plot scale). To assess the relative contribution of slope and elevation to tree turnover, we run a hierarchical regression. The annual mortality rate ranged from 0.6 up to 2.6 % year^{-1} and annual recruitment rate ranged from 0.5 up to 1.7 % year^{-1}; turnover varied from 0.5 up to 2.1 % year^{-1}. We observed that slope is a strong predictor of tree mortality and turnover, whereas altitude does not significantly improve the model. Annual tree mortality and turnover decreased with the increase of slope. The relationship between tree mortality and slope was size-dependent, as reported in previous studies in the Amazon forest. Our results challenge previous report of higher mortality in steep slopes.

S05.P.14

Colonization of large-seeded species in hedgerows in an Atlantic Forest landscape is influenced by neighboring forest cover, but not by connection itself.

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Hedgerows are common structures in the rural landscape that may be habitat for generalist forest species as well as a dispersal corridor between forest fragments isolated by the agricultural matrix. The aim of this study was determine whether hedgerows connected or not to forest patches are more easily colonized by large-seeded animal-dispersed tree species, which usually show less ability to be dispersed through fragmented landscape. Data were obtained from floristic survey of eight hedgerows, four connected and four not connected to forest patches. Seed size thresholds used for separating small and large seeds were 0.6, 0.7 and 0.8 cm in length. Were analyzed the relationship of the richness and abundance of large and small seeds with the connection of the hedgerow, age, length, width and origin (planted/spontaneous) of the hedgerow, proximity index (PI) and the distance from the largest fragment forest in the region. All hedgerows showed greater abundance of large seeded than small-seeded species for all thresholds. However, species richness was higher for species with large seeds only when the threshold was 0.6 cm, showing a trend of midsized species to disperse to and colonize the hedgerows. There was no relationship between seed size and the age, length, width and origin of the hedgerows, but considering all the variables in a generalized linear model was observed that all contribute to explain the abundance of species with large seeds. Also, there was no relationship between seed size and connection, possibly because hedgerows characteristics (e.g. microclimate) may have been influencing more than the connection over establishment of species. Furthermore, at longer distances of the largest forest fragment the PI explains a greater portion of large propagules abundance, demonstrating the importance of small forest fragments on the colonization of hedgerows by large seeds.

Key-words: landscape structure, hedgerows and seed size.

S05.P.15

Surrounding landscape affectswoody species regeneration in reforested sitesin Atlantic forest domain.

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Brazilian Atlantic Foresthas been fragmented at such rate thatsecondary succession, spontaneous or induced by restoration, can be delayed by reducing biological flows. Reforestationswith native species are means to minimize some fragmentation effects, allowingmicroclimate changes and attractingseed dispersers. However, continuing ecological successionmay depend on the structure of surrounding landscape, which can includevarying amount of remnant habitat. While reforestations are simple ecosystems well-suited to investigate landscape dispersal patterns, early detection of seed shortage in those environments are valuable information for restoration planning and management. This study aimed to analyze the landscape influence on plant diversity in the understory of 18 reforested sites in north of Parana state, ranging from 6.25 to 8.4 years old. Semideciduous Atlantic Forest remnants accounts for under 8% of regional landscape area and are in the midst of soybean plantations. Landscape structurein 500 and 1000 m radius neighborhoods for each site were analyzed from satellite-derivedland cover maps.Generalized Linear Models were used to find better predictors for the woody plant diversity, using the Akaike information criteria (AIC). Most species regenerating were arboreal, zoochoric and early succession species. Remnant vegetation proportion in 1000 m radius (RVP1000), distance to the nearest forest remnant (DNFR) and reforestation plantedspecies richness better explained abundance of zoochoric (AIC=1207) and abundance of late succession species (AIC=1219). Both the RVP 500 and DNFR best predicted zoochoric species richness (AIC=65). RVP500 predicted late succession species richness (AIC=59). Our results suggests that landscape structure just around restoration sites (up to 500m) is critical for arrival of late succession species and thus for the fate of secondary succession.

Key-words:forest fragmentation, seed dispersal, ecological restoration, secondary succession.

S05.P.16

Conservation genetics of endangered fern *Dicksonia sellowiana* Hook. (Dicksoniaceae) in Brazil

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Dicksonia sellowiana is a typical fern of the Araucaria Forest, an endangered subformation of the Atlantic Forest. The species is threatened due to its habitat degradation and its exploitation by extractivism and craftwork industry. The objectives of this study were to know the species populations structure in seven Brazilian regions, in order to evaluate fragmentations impact for genetic variability maintenance aiming to generate subsidies for its conservation through protection laws and management of the species and its biome. This study analyzed ISSR markers and the intergenic spacers *trnL-trnF* and *atpB-rbcL* sequence of cpDNA to check the variability and the genetic pattern for 150 individuals of *D. sellowiana* in seven populations from Rio Grande do Sul up to Minas Gerais States. The sampled populations are not genetically structured – $F_{st} = 0.11$ and $\Theta^B = 0.08$ ($P<0.0001$). The intra-population genetic differentiation (88.60%) is greater than inter-population (11.40%) differentiation. The STRUCTURE did not detect individuals separation according to the geographical sampling (K=4). The intergenic spacers sequences presented none to very low variability. The genetic pattern observed was probably affected, by two phenomena: geological events in early ages that occurred throughout the Tertiary and regression events through forest fragmentation and expansion during the Pleistocene's (Quaternary) glacial cycles, allied to recent habitat fragmentation. Based on the genetic pattern, the results reveal that the studied populations can be considered ESU's for conservation, deserving severe efforts for this goal. As a typical species of a threatened biome, *D. sellowiana* can be considered an indicator for conservation purposes of the Araucaria Forest.

S05.P.17

Intraspecific variation of Atlantic Rainforest understory phenology: plant responses to light and microenvironment

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The degree of within species synchronicity in reproductive phenology of plants growing in shaded, humid understory of tropical forests is still poorly understood. We evaluated the influence of light and local environment in the phenological response of four plant species typical from Atlantic Rainforest understory: *Ouratea verticillata*, *Piper* cf. *permucronatum*, *Psychotria nuda* and *Cabralea canjerana*. We monitored the phenology and counted the number of reproductive structures produced by each plant from January 2009 to April 2010. Individuals were sampled in three forest environments: natural edge (river side), gap, and interior. We measured variables near each sampled plant: (i) microclimatic: temperature, relative humidity and Photosynthetic Active Radiation (PAR); (ii) microenvironmental: canopy openness, canopy height, vertical density, distance to river and/or gap edge, and distance to closer conspecific, and (iii) plant structure: circumference at ground height and at breast height, plant height, crown height and crown size. Individuals were separated in two groups using the K-means analysis: G1 interior (forest interior and gap) and G2 edge (river side), separated by Principal Component Analysis, mainly due to microenvironment light. The microenvironmental characterizations of G1 and G2 were significantly different, but the plant structural measurements were similar. Using multiple stepwise regression the maximum production of individuals from all four species was related to structural, microclimatic and microenvironmental (canopy height, vertical density, distance to gap edge) variables depending on the species considered. The reproductive phenology was significantly seasonal and correlated to the wet/hot season, following the pattern described for Atlantic Rainforest trees. The phenology of the species was explained by structural characteristics and microenvironmental variables directly or indirectly related to local light. Light conditions derived from natural edges, gaps, or the local forest structure where the plant grows, were the key factor defining the phenology of the four species in the understory of Atlantic Rainforest. (Financial Support FAPESP, CNPq)

S05.P.18

Are edges and young forests always preferred by leaf-cutting ants? The case of *Acromyrmex* in the Atlantic forest

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Leaf-cutting ants (*Atta* and *Acromyrmex*) are dominant herbivores in neotropical forests. Previous studies have shown that nest density of *Atta* species is higher in young secondary forests and forest edges, but information about the response of *Acromyrmex* species is scarce. In this study we asked whether *Acromyrmex* nest density at different distances from forest edges would show the same pattern of *Atta* species. We also compared *Acromyrmex* nest density between small or large forest fragments (i.e., with more or less border effect, respectively) and regeneration state (young or old secondary forest areas). Twelve forest fragments in the Parayba river basin and one forest remnant in Guapiaçu river basin, both located in Rio de Janeiro State, were sampled for ant nests, with 10m width-transects going from edge to centre of forests. We found seven *Acromyrmex* species, including the three subspecies of *A. subterraneus*. The most abundant species was *A. niger* that represented 63% of all nests sampled. *Acromyrmex* density did not differ according to fragment size (12.4 vs 9.6 nests per ha in large or small fragments, respectively, Wilcoxon paired test, P = 0.83), neither we found a border effect (Kendall correlation, P = 0.89). There was no clear pattern of nest density in old and young forests. Results were qualitatively the same using the most abundant species only. *Acromyrmex* and *Atta* seem to respond in different ways to forest edges and age, and this could be an important difference when considering the impact that leaf-cutting ants, as a group, exert over their environment.

Key words: Rainforest, Palatable Forage Hypothesis, forest fragmentation, insect-plant interactions

S05.P.19

Functional and phylogenetic diversity along a successional gradient of Atlantic Forest

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During secondary succession, mechanisms determining species turnover and assembly rules are still unclear. If we consider secondary succession as community assembly in action, the structural and historical factors also directly influence community organization. Environmental filters generated during the successional process should have selected specific traits (resulting in trait convergence), but species coexistence should be restricted by similarity of traits (leading to trait divergence). In addition, whereas the factors structuring the community select species for specific attributes(either by convergence or divergence), the regional pool of species is determined by historical factors related to the biogeography and macro-evolutionary processes reflected in the phylogenetic structure of the community. In this work we compared the species attributes (8 vegetative and reproductive traits) and phylogenetic relationships of 25 successional forests (297 species), ranging from 4 to 120 years old of Atlantic Forest in Brazil. We tested if functional and phylogenetic diversity (Rao´s quadratic entropy) increase during successional trajectory to infer assembly rules determining species turnover during succession. We found that functional diversity increases during the succession and is significantly followed by an increase in leaf length and decrease in arboreous habitus and specialist entomophilous pollination. On the other hand,phylogenetic diversity did not change along the successional gradient, although there were significant changes in some high clades (increase in Lillianae and decrease in Caryoplyllanae and Santalanae). Our results suggest that succession is reflected in trait diversification within a limited group of clades and that assembly rules during succession are constrained by multidimensional historical and structural factors, which leads to species-rich communities.

S05.P.20

Genetic diversity of *Enyalius perditus* and *Enyalius bilineatus* from Atlantic Forest fragments of Minas Gerais State (Brazil)

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The lizards from *Enyalius* (Leiosauridae) genus are endemic from Brazil. These animals presented a wide distribution in the Atlantic Forest remains and there is an Amazon species. There are few studies regarding this genus and efforts should be done to increase the localities studied and sample size to better understand the evolutionary history of these species. *E. perditus* occurs in Rio de Janeiro, São Paulo, Paraná and Minas Gerais States and *E. bilineatus* can be found in opened areas from Cerrados and Caatinga. Molecular markers are widely used to quantify the genetic diversity, measure gene flow, and genetic structure in animal and plant species. We investigated the genetic diversity between and within populations of *E. bilineatus* (N=12) from two localities of Área de Proteção Ambiental da Serra de São José (Tiradentes, Minas Gerais State) and *E. perditus* (N=7) from two localities of Parque Estadual do Ibitipoca (Minas Gerais State). A 274pb sequence from the Cytochrome Oxidase *c* subunit I (COI) was analyzed in this study. Four distinct haplotypes (two for *E. perditus* and two for *E. bilineatus*) defined by 54 polimorphic sites were found. The global haplotype diversity was 0.678, being low (0.303) to *E. perditus* and higher (0.571) to *E. bilineatus*. The genetic distance between the two species was 22.8% and the within species distance was 0.7% for *E. perditus* and 0.2% for *E. bilineatus.* These values are in agreement with studies regarding genetic diversity of other reptile's species. The relationship among the haploypes were presented by network that showed two clusters representing both species and separated by 47 mutation points. This is the first study measuring the genetic diversity of *Enyalius* species and provided relevant data to better understand the relationships among and within different populations as well as the migration pattern of this endemic genus.

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S05.P.21

Species abundance distribution models on analysis of relation between bird diversity and environmental and anthropic variables

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Species abundance distribution (SAD) models are suitable to represent the diversity of natural communities because they describe the relation between number of species and individuals and, therefore, the dominance degree in communities. Additionally, the study of regional or local patterns of diversity is central in community ecology, but the occurrence and/or interaction of processes at different scales is constraining to understand the role of each one in the resultant community structure and diversity. In this work, we evaluate the relation of productivity, WWF's ecoregions and habitat loss and fragmentation with Fisher's Alpha diversity index of understory bird communities in southeastern Brazil. For this, we build simple and multiple linear Gaussian models using the predictor variables in isolation or combined with each other, in order to choose that or those models that best describe the diversity variation observed in the data. The best model among the competitors was one that provided a link between productivity and diversity, but with the addition of the loss or fragmentation of habitats, as well as the interaction between productivity and habitat loss were also plausible explanations. Despite these results, the uncertainty about the existence or absence of anthropogenic variables effects on diversity in these multiple models point to greater importance of productivity as a predictor of diversity in this region. Therefore, the influence of factors in regional scales, such as productivity, as well as the effect of anthropic alterations at landscape level should be considered in the study of diversity patterns and in proposing measures for species conservation.

S05.P.22

Phenotypic plasticity and genetic variability of an endemic species of cacti

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Rhipsalidae is one of the two most representative epiphytic tribes of Cactoideae in Brazil, and its center of diversity is the Atlantic formations. Within this group, the species *Rhipsalis dissimilis* forma *epiphyllanthoides* is remarkable for its rupicolous habit, besides being endemic to the rocky outcrops of Parana state, in south Brazil, only known from two populations in the state. The goal of the present study was to evaluate the phenotypic plasticity of this species through morphological and anatomical features, and check whether this can be correlated to the genetic variability between the two populations (Guartelá State Park and Vila Velha State Park). Seventeen individuals were collected from each population. For each individual were measured stem length and diameter, fresh and dry matter, water content, stomatal and areoles density. For the anatomical studies, were analyzed cuticle, epidermis, hypodermis and cortex thickness, and vascular cylinder diameter. For the molecular studies two intergenic spacers of cpDNA (*psbA-trnH* and *trnS-trnG*) were used. The morphological and anatomical data were statistically different between the populations, and could be associated to the different climatic conditions of each study area: in Guartelá, there are more sunlight and higher temperatures than in Vila Velha, so the individuals of Guartelá are more robust, with thicker protective tissue (epidermis) and greater amount of water storage tissue (cortex). No genetic variability was detected within and among populations. Events of genetic drift should play a very significant role in the spatial genetic structure of *R. dissimilis* forma *epiphyllantoides*, as the two populations are isolated geographically. The investigation of ecological processes associated with this species and analysis of other markers with faster evolutionary rates, such as ISSR, are of great importance to help in future conservation programs for these species, only known from two populations in Parana state, occurring in areas of natural preservation.

S05.P.23

High population structure and hybridization in a montane Atlantic forest orchid species complex

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The mountain ranges of Serra do Mar (SMR) and Serra da Mantiqueira (SMN) comprise the highest geological formations of southeastern Brazil. The effects of the origin and evolution of such orogenic systems in shaping biodiversity of montane Atlantic rainforest taxa is poorly known. Contrary to lowland taxa, recent studies suggest persistence of southern populations of cold-tolerant vertebrates during the last glacial maximum. *Cattleya coccinea* comprises a well-known orchid of mountain forests of SMR. A morphologically very closely related species, *C. mantiqueirae*, has been traditionally recognized as exclusive for SMN. The difficulty of morphologically distinguishing these two species and the chaotic taxonomy of the group led us to test the hypothesis that these two species comprise separate lineages that diversified along the mountain ranges of SMR and SMN, respectively. We carried out phylogenetic and population genetic analyses based on ISSR and cpDNA of six populations to evaluate population diversity and structuring. Five outgroup species plus populations of two phylogenetically and morphologically closely related species were considered. The phylogenetic analyses revealed well-supported clades corresponding to distinct populations but not to distinct geographical regions. The *C. coccinea*-*C. mantiqueirae* species complex is paraphyletic considering the closely related species *C. brevipedunculata*, from Serra do Espinhaço, and *C. wittigiana*, from Espírito Santo. The studied populations comprise monophyletic groups according to both data sets and are strongly structured according to AMOVA analyses, ΦST statistics and model-based clustering. All populations show low diversity indices among individuals with the greatest portion of genetic diversity found among populations. Population analyses corroborate phylogenetic groupings. The data also suggest the occurrence of past hybridization events in the Alto Caparaó population. High levels of inter-population diversity suggest historical persistence. Putative expansion events may have favored the occurrence of hybridization. Fine-scale genetic studies are currently being developed in other populations to test such predictions.

S05.P.24

Seasonal variation of soil N-transformation rates along a precipitation gradient in three restinga vegetations of Southeast Brazil

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Restinga vegetation covers Brazilian sandy coastal plains, and is known for their conspicuous diversity, despite harsh environmental factors such as low soil nutrient content and drought. Consequently, mineralization of vegetation-derived organic matter plays a key-role in nutrient supply, regulating soil fertility and ecosystem functioning. Thus, estimates of nitrogen (N) available forms and transformation rates are a useful tool to assess nitrogen availability and dynamics. Here, we compare the seasonal variation of soil mineral N-forms and their transformation rates in three restinga sites in Southeast Brazil. Samplings were carried out in April 2010 (end of rainy season) and September 2011 (end of dry season) at the *Massambaba* Environmental Protection Area (RJ); Restinga of *Jurubatiba* National Park (RJ); and Serra do Mar State Park, *Picinguaba* Nucleus (SP). The formations have distinct physiognomies, and precipitation regimes. In common, are the deep sandy soils, which are characterized by high acidity and nutrient deficiency. We randomly collected 20 samples (450 mg) from topsoil (0-10 cm), and made the extraction of N-NH_4^+ and N-NO_3^- (1M KCl). Soil was incubated and we made a second extraction, using the difference between determinations to estimate net mineralization and nitrification rates. Concentrations of mineral N forms were quite low, observing the prevalence of N-NH_4^+ for plant nutrition. The restinga of *Jurubatiba* had the lowest concentrations of both forms, while the highest N-NO_3^- availability was observed at *Picinguaba*. Immobilization suppressed N-transformation rates, which were negligible. Precipitation reduction enhanced microbial immobilization during the driest period; however, an increase in the availability of N-NH_4^+ (*Jurubatiba*) and NO_3^- (all sites) was observed. Soil characteristics and organic matter nutritional quality resulted in low nitrogen transformation rates. Thus, precipitation increment influenced microbial activity both positively – by increasing soil moisture, favoring decomposition processes – or negatively – by increasing the loss of inorganic forms through lixiviation and gaseous losses.

S05.P.25

Effects of bird perches and plant functional traits on seed arrival and seedling establishment in abandoned pastures of Southern Brazil

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Restoration of degraded lands is an important practise for the conservation of biodiversity and reestablishment of ecosystem processes and services. Birds play a major role in seed dispersal and forest regeneration in pasture areas; the placement of bird perches presumably accelerates this process. We evaluated, monthly for two years, the seed rain and seedling establishment under isolated trees, bird perches and open pasture in sites close (10m) and distant (300m) to the forest edge. Furthermore we assessed how functional traits predict seedling establishment. In each site we selected 10 isolated trees and installed 10 bird perches and 10 open pasture plots, below which we allocated a seed trap (0.2 m^2) and a regeneration plot (0.5m^2). We sampled a total of 131,826 seeds from 115 species and 487 seedlings from 46 species in both sites. Seeds were mostly from small seeded shade intolerant bushes, whereas seedlings were medium seeded shade intolerant trees. Isolated trees and bird perches greatly increased the input of seeds and seedlings, however, isolated trees contributed to a greater richness. Overall the abundance and richness of seeds and seedlings differed between the years of sampling but not between sites. The species composition of seeds and seedlings differed among treatments, sites and years. Seed size predicted seedling establishment, large seeded species established more efficiently than medium and small seeded species, whereas shade tolerance did not predict seedling establishment. The use of perches may be an important restoration strategy able to accelerate forest succession at suitable costs in tropical degraded lands as long as a forest seed source is available.

S05.P.26

A Survey of Arecaceae in the Southern Brazilian Atlantic Forest as indicators for understanding the Successional Stages

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The Iporanga residential condominium is located in the Guararu Protected Area, in the Atlantic Forest of São Paulo State. The condominium presents two sides, one faced to the ocean and the other faced to the estuary. Arecaceae is one of the most important plant families in this ecosystem. The study aimed at obtaining information on the successional stages of forest fragments through the quantitative aspects and floristic of Arecaceae, in three different areas comprising 27 plots (9 plots of 10mx20m in each one). The area A is situated between residences and the well preserved study area B in the head of the Iporanga river bassin, both faced to the sea; the third area (C) is faced to the estuary. Eight species were found: *Attalea dubia, Astrocaryum aculeatissimum, Bactris setosa, Euterpe edulis, Geonoma elegans, Geonoma schottiana, Syagrus romanzoffiana* and *Syagrus pseudococos*, 304 adult plants, and 1162 seedling among 1466 specimens surveyed. Our results in area A showed 357 seedlings and 63 adults whose average mean basal area was 0.014 m². In area B we found 587 seedlings and 230 adults and the average basal area of 0.033 m² due to larger individuals (mostly *E. edulis*). In area C, with a more relatively opened vegetation, we found 218 seedlings with average basal area of 0.0213m², due to the smaller number of adults (only 11).We conclude that area B is better preserved in the advanced stage of succession and its ratio of reaches 1 adult to 2.5 seedling while area C he worst ratio (1 adult to 19.8 seedlings) shows an early stage of succession with a larger number of young plants in a more perturbed area, this area is in the intermediate stage of regeneration and the results probably reflects the different human interferences occurring on the site along the time.

S05.P.27

Edge effects on riparian reforestation strips with native species

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One of the main limits of the recovery of the ecological integrity in restored environments are the edge effects, whose relative importance is dependent on the shape and size of the reforestation sites. Thus, the goal of this study was to identify any existing differences among the edges and the center of wide (i.e., >90m) riparian native species reforestation strips. The selected strips ranged from 90 to 120 meters wide, aging 8-10 years from implementation. In each strip, 15 plots of 10x10m were established, being five at the edge facing crop fields, five at the edge facing the water reservoir and five at the center of the strip; in each plot, the woody species richness and abundance, herbaceous cover, basal area and canopy openness were registered. The basal area of regenerating individuals and the grass cover were significantly bigger at the edges when compared with the center. The cover of non-grass ruderal species and the richness of regenerants with zoochoric dispersion were bigger at the edge facing the crop fields and the canopy openness was larger at the edge facing the water reservoir. Canopy openness showed positive relationship with grass cover and a negative one with both the species richness and the abundance of regenerating individuals. It is concluded that the edges differ from the center in riparian reforestation strips, since the edges enable a higher development of grasses and other ruderal species, as well as a higher increase of mass in pioneer regenerating individuals. Those differences are associated with higher canopy openness and by lateral incidence of light, favoring the growth of shadow-intolerant species. The fact that the edges are the access point of dispersing animals from the surroundings may partially explain the higher richness of regenerants with zoochoric dispersion in those environments.

S05.P.28

DIAMETRICAL DISTRIBUTION ANALYSIS OF *Mollinedia Widgrenii* A.DC. (MONIMIACEAE) IN A FRAGMENT OF SEMIDECIDUOUS MOUNTAIN FOREST

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Vegetation remnants, known as forest fragments, were originated due to the progressive deforestation over the years. In order to define the conservation and management strategies for these ecosystems, information about the structure of the regenerating individuals of these forest fragments is required. Thus, the aim of this study was to analyze the diameter distribution of *M. widgrenii* tree species in a fragment of Semideciduous Mountain Forest, located in the campus of the Universidade Federal de Lavras, Minas Gerais. The sampled tree community was divided into two transects, where 21 plots belonged to transect A, and 28 plots to transect B, comprising a total of 49 plots of 20m x 20m each. In each plot, a subplot of 7m x 7m was inserted, within which all the regenerating individuals of *M. widgrenii* with a diameter at ground height ≥ 1cm and ≤ 15cm were measured with a digital caliper and their heights were determined with a graduated tapeline. The results showed a total abundance of 129 individuals, with an average diameter of 2.57cm. The individuals studied presented a reversed J-shape with the highest concentration of individuals in class I (124 individuals), while the second and third classes had two and three individuals, respectively. The reversed J-shaped histogram behavior found for *M. widgrenii* indicates favorable site conditions to the development of this tree species, as well as its high capacity of regeneration in the studied environment. Nevertheless, broader time scale studies are required to determine the strategies for the conservation of this species.

Keywords: population, conservation, ecology

S05.P.29

Ecological filters determining functional convergence and divergence on herbaceous and seedling strata of an Atlantic rain forest of southern Brazil

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Understory plant communities are constrained by several biological filters mainly related to shading and competition. These filters force the species to show specific functional traits, depending on their survival strategies. In this study we assess how light availability and competition between plant individuals influence convergence and divergence of leaf functional traits. We studied plant individuals of the herbaceous and seedling stratus in the understory of a mixed Araucaria-dense Atlantic rain forest in southern Brazil. In 12 circular plots of 0.5m radius we sampled all plant individuals 50 - 100 cm in height, independent of their species. Our environmental variables were canopy openness and density of individuals inside each plot. For all individuals we took the mean and the coefficient of variation (CV) of leaf area and leaf form. We used linear regression to test if the density of individuals was related to canopy openness. We also used linear regressions to evaluate how leaf traits and CV varied with environmental variables. Canopy openness and density of individuals was not related to each other. Only leaf area and CV were related to environmental variables. Leaf area and CV decreased with canopy openness while CV increased with increasing density of individuals. We conclude that leaf form is not an important functional trait that responds to environmental filters from this study. Light limitation favored individuals with greater leaf area, and increased functional diversity. Therefore in illuminated sites, only small leaves were present. Great functional diversity can allow the coexistence of many individuals in high density plots.

S05.P.30

Microtopography and tree functional and phylogenetic diversity in Atlantic forests, southeastern Brazil

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If the terrain is convex and consequently maintains low soil moisture and nutrient availability, it is expected to filter out functionally similar and closely related trees when traits show phylogenetic signal. We investigated the co-occurrence of trees on small spatial scale and tested predictions of the neutral and niche-based theories in two vegetation types in the Atlantic forest, southeastern Brazil. In a rain forest and a seasonal forest, we sought correlations between (1) indices of species co-occurrence and both functional differences and phylogenetic distances, and between (2) measures of functional and phylogenetic diversity and indices of topographic convexity. We measured six soft traits for each species: leaf area, blade type (simple or compound), margin type (toothed or entire), venation (brochidodromous or non-brochidromous), toughness (membranaceous or coriaceous) and the mean height. We constructed a functional and a phylogenetic dendrogram for all species. We also evaluated to which extent the spatial distribution of the functional and phylogenetic diversity is due to the spatial distribution of the convexity indices. In seasonal forest plots, functionally similar species tended to co-occur more than expected by chance, whereas in the rain forest plots, the phylogenetically closely species tended alternatively to co-occur less than expected at random. The positive relationships between microtopography and phylogenetic diversity supported that the soil moisture and soil nutrient availability may mediate the species assemblage in seasonal forest. Nevertheless, the phylogenetic and functional diversity were spatially structured in rain and seasonal forest, respectively, and may have emerged from stochastic population dynamics and limited dispersal. Thus, most of our results support that neutral processes largely determine the functional and phylogenetic diversity of trees on fine spatial scale. Wherever the environmental conditions become extreme in both directions of the environmental gradient, towards harshness or favorability, niche-based processes may be predominant.

S05.P.31

Relationship between soil fertility and species richness in a primary Atlantic Rainforest patch from Southeastern Brazil

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Soil fertility is still widely accepted as a predictor of stand´s species richness. The relationship is thought to be hump-shaped with low richness found on unfertile as well as on very fertile soils, while high numbers of species are found on stands with intermediate soil fertility. Objective of this study is to test this pattern in a tree species community from a primary Atlantic Rainforest, the so-called Forest of Seu Nico (FSN), from Viçosa, Minas Gerais, Brazil. One hectare was divided in 100 plots of 10x10m. All trees within these plots with diameter at breast height greater or equal to 3.2 cm were identified. Three soil samples were collected in each plot and analyzed in the labs of the Soil Department, Federal University of Viçosa, Minas Gerais, Brazil. Per plot soil fertility was measured as soil acidity (pH) averaged from all three soil samples collected within that plot. Soil acidity was used because soil´s pH shows positive correlations to phosphorus, nitrogen and potassium concentrations, which are generally accepted as most important macro nutrients. Within all 100 plots, 2529 individuals from 218 tree species were found. Per plot species richness ranged from 10 to 31 (on average 18.61 ±3.82). Soil´s pH varied between 3.96 and 5.63 (on average 4.43 ±0.32). A linear relationship between soil fertility and per plot species richness is negative with

$$\text{number of species} = -5.5 * pH + 43.432 \qquad (1).$$

This linear correlation is significant with $R^2 = 0.218$ ($F_{1;98} = 18.07$, $p < 10^{-3}$). Even if soil´s pH ranges about two magnitudes due to underlying logarithmic scale, no hump-back form of the pH-richness relationship can be detected. As these findings are congruent with other studies from our laboratory, we consider soil fertility as a poor predictor of species richness, at least on a local scale.

S05.P.32

Variation in floristic composition and demography over a 12-year period in a Brazilian lowland Atlantic forest

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The lowland Atlantic forest in northern Rio de Janeiro has been reduced to about 5% of its original area, with the remaining natural vegetation strongly fragmented. Some fragments are still under illegal logging practices. The aim of this study was to assess the impacts of a single cycle of selective logging (occurred in 1991) on the turnover rates of a remnant of lowland seasonal Atlantic forest (1200 ha) in São Francisco de Itabapoana, Rio de Janeiro, Brazil. Our aim was to also check whether the tree communities of this forest has experienced a change in structure and floristic composition over a 12-year period. The climate is markedly seasonal, with an intense dry season from May to August. Mean annual rainfall was 805 mm (1996-2002) and 933 mm (2002-2008). In 1996, eight plots of 50 m x 50 m were allocated in two areas: unlogged and logged. In each plot, all trees ≥10 cm DBH were enumerated, identified and measured. Vouchers were lodged at UENF Herbarium. Trees were sampled in march 1996. In march 2002 and march 2008, all tagged trees were remeasured. Recruits were enumerated and measured. Floristic composition changed very little over a 12-year period in both areas, with no important shifts in the ranking of the ten most important species, although some species increased dominance. Recruit rates were similar between areas. However, for tree mortality there was an increase in 2002-2008. Total basal area in unlogged plots increased 2.7 m^2 (1996-2002) and only 0.7 m^2 (2002-2008), while for logged plots the values were 3.4 m^2 (1996-2002) and -0.8 m^2 (2002-2008). Differences found between areas seems to be related to an opener canopy caused by selective logging. Events of heavy rainfall, especially those occurred in January 2007, appears to have diminished tree survival and total basal area in both areas.

S05.P.33

Does edge effects in tropical forest drives to impoverishment of galling insect assemblages? A case in Atlantic Forest of Brazil

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In tropical rain forests, edge-affected habitats alter the abundance and distribution of shade tolerant and pioneer plants species, potentially modifying population patterns of their specialist herbivores. In despite of importance of interactions between plants and specialist herbivore insects in tropical ecosystems, consequences of habitat loss are poorest understand. Galling insects are herbivore which produces morpho-physiological modifications in plant tissues and have a narrow dependence of their host plants. Knowing of highly specific relationship between galling insects and host plants, we hypothesized that floristic simplification faced by Atlantic forest edges result in a similar impoverishment of galling insect assemblages in terms of richness and composition. We sampled woody saplings smaller than 2 m in height and their associated galls in 20 plots of 100-m^2, 10 on edge and 10 in core area. We recorded in core area 38 host plant species and 43 galling insects species. In edge were found 17 host plant species and 19 galling insect species. Our analysis found markedly different taxonomic composition between habitats for plant and insect assemblages forming two clearly and segregate clusters. Edge habitat decreased in nearly half in relation to biotic richness of core area. Monophagous insects are particularly susceptible to habitat loss because they do not survive without their specific host plant and thus, our findings highlight the negative consequences of edge creation on a highly specialized group of herbivorous insects. Our study suggests that with taxonomic homogenization of flora in regional scale it is expected that monophagous insect assemblages follow the same trend.

S05.P.34

STRUCTURE OF FRUIT-FEEDING BUTTERFLY ASSEMBLAGES IN THE ATLANTIC FOREST OF SOUTHEASTERN BRAZIL: COMPARISONS BETWEEN CANOPY AND UNDERSTORY

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Tropical forests are structured through several dimensions, including the vertical strata, thus shaping the distribution of species in this dimension. Diversity measurements at different heights, areas and periods provide a description of the variation in communities structure through spatial and temporal scales. Fruit-feeding butterflies obtain nutritional requirements from juices of rotting fruits, fermenting sap, or animal waste, and are easily attracted by baited traps. In the neotropics, some butterfly groups have revealed marked vertical stratification. This study aims to compare the abundance (N), species richness (S) and composition of fruit-feeding butterflies between two vertical strata (canopy and understory) in the Brazilian Atlantic Forest. Samplings were carried out monthly in six areas in a site of semideciduous forest in São Paulo State, each one with ten bait traps alternating between canopy and understory. The first six months (October 2011 to March 2012) were analysed through individual-based rarefaction, species abundance distribution, NMDS ordination based on Morisita similarity, with significance accessed by ANOSIM and evenness index. Overall, 1116 fruit-feeding butterflies distributed in 61 species in four Nymphalidae subfamilies were recorded in both strata. The canopy presented higher richness and abundance (S=49, N=702) than the understory (S=31, N=414). The species composition segregated between canopy and understory (p=0.002, R=0.876), with the canopy presenting a lower species turnover. The canopy presented a higher dominance, with *Memphis appias* being the most abundant species. This study is pioneer in evaluating vertical stratification of butterflies in the Atlantic Forest, and the addition of more data should reveal more consistent patterns of diversity and structure of fruit-feeding butterfly assemblages in the Neotropical region.

S05.P.35

The effect of linear edges on phylogenetic diversity at the Atlantic Rain Forest, RJ, Brazil

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Fragmentation and habitat loss are among the main threats to forests since lead to edge effects that promote changes in abiotic and community structure. Within this context, the internal deforestation, characterized by linear canopy openings within forest remnants, is usually the result of roads or transportation of refined products through pipelines. However, linear edges might be less harmful since the matrix is narrower than in a typical fragmentation, what causes less impact on vegetation. Although several studies have reported how edge effect affect species richness, abundance and composition, none study has focused on the consequences of linear edges on the tree phylogenetic diversity. Our study was conducted at the Tinguá Biological Reserve which is one the best preserved areas of Atlantic Rain Forest. This reserve is crossed by two underground pipelines whose installation and maintenance of the underground pipelines implicates in linear canopy openings of two distinct ages (30 and 200 years old). Thirty nine permanent plots were established to compare both edges with preserved interior areas. To evaluate the extent of edge effects of distinct ages has affected the phylogenetic diversity of the interior tree assemblages we calculated the nearest taxon index (NTI) and the net related index (NRI). The NRI was significantly lower in the interior in comparison to the edges of both ages. For NTI, interior were significantly lower only in relation to the edges 200 years old. Our results indicate an impoverishment in the phylogenetic diversity in linear edges, especially for the edge of 200 years old. Although it has been assumed that a community is phylogenetically structured only when NTI and NRI are <1.96 or >1.96, we observed significant differences between edges and interior within this variation. Thus, we suggest that even subtle differences in phylogenetic diversity should not be neglected especially for conservation purposes.

S05.P.36

Divergent successional trajectories in invaded and burnt pastures in the Brazilian Atlantic forest.

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Conversion of forest into fire-prone pastures is a common land use modification in the tropics. These pastures are easily invaded by fire-resistant species that may interact with fire to generate long-term changes, with implications for management and restoration. We studied a gradient of secondary vegetation with different fire histories in areas once occupied by lowland Brazilian Atlantic rainforest. These areas have become dominated by *Gochnatia polymorpha* (Asteraceae), a woody fire resistant treelet from the *cerrado* biome. We aimed to understand the effect of repeated fires in the vegetation structure and composition. We compared scrubs burnt zero, eight and twenty years ago, secondary forest burnt more than 35 years ago and old-growth forest.
We marked three 60mx30m plots in each vegetation type and surveyed the overstory (dbh≥5cm in six 10mx10m subplots) and the understory (1cm≤dbh<5cm in six 5mx5m subplots). Structural variables were compared through ANOVAS, while composition was compared through chord-distance based PCA. We modeled through variation partition by partial constrained ordinations (pRDA) the relative effect of (1) fire regime and soil variables on overstory composition and (2) on understory and of (3) fire regime, soil variables and overstory on understory composition.<dbh <dbh
Structural complexity and diversity increased along the impact gradient but floristic composition differed mainly between mature forests and burnt areas (PCA first axis: 65%). Variation within mature forests (PCA2: 16.25%) was higher than within all burnt areas (PCA3: 11.37%), which remained grouped in spite of differences in regeneration time and structure. Fire regime alone explained little of this variation (3%, 2% and 0%; in each model) while soil (19%, 14%, 23%) and fire-soil interactions (52%, 39%, 39%) were predominant. We suggest that fire-soil interactions produce a divergent successional trajectory, where structure becomes more complex with time but succession would not lead to the recovery of mature forest floristic composition. </dbh
</dbh

S05.P.37

Linear canopy opening did not affect the proportion of seed dispersal syndromes in a tree community at the Atlantic Rain Forest, RJ, Brazil

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The fragmentation process and the lost of habitats are the main threats in the forests ecosystems. An edge is created due the forest fragmentation and the community is exposed to the new conditions, generating the edge effects. Sometimes those openings can affect the close tree community directly, with changing in biotic and abiotic components, as well indirectly, by the interactions relationship. So, in this context, we studied if those effects are changing the proportion of seed dispersal in the tree community close by two linear canopy openings comparing to forest interiors far at least 400m from edges. Our study was conducted at the Tinguá Biological Reserve that, despite preserved, is crossed by two underground gas lines whit different ages (30 and 200 years ago). We allocated 39 plots 30X10m, 10 in each edge forest and 19 sparse by the interior forest. Nor the 30 years ago edge or the oldest one (200 yr) showed differences from the forest interior to the proportion of abundance of individuals ($G_{(6)}$= 8.35; $p>0.05$) and richness of species ($G_{(6)}$= 3.63; $p>0.05$) in all of three primary seed dispersal syndromes: dispersed by animals, wind-dispersed, and barochory. For all sites, zoochory was the most important syndrome (89.9% of individuals and 86.6% of species), followed by wind-dispersed (7.5% of individuals and 8.8% of species) and barochory (2.5% of individuals and 4.6% of species). These results show us that linear canopy openings did not affect the proportion of seed dispersal syndromes in a tree community at the Atlantic Rain Forest. But, we also have to consider how wide this classification is as well how the tree community is changing over the years. We suggest that this kind of fragmentation is under by intermediate disturbance and the community close by the edge could answer as interior forest affected by gap.

S05.P.38

Diversity of nematode community in sugarcane fields and remaining of Atlantic Forest

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Sugarcane fields have been increased in the last century due to relevant economic position specially biofuel manufacturing. This crop management affects soil biological dynamic, particularly nematode community. Because of their relevant position in soil food web, nematodes have been used as bioindicators of ecosystem conditions. Thus, the aim of this work is to evaluate the distribution of nematodes communities in sugarcane areas with and without vinasse application as well in the Atlantic Forest areas, in municipality of Ribeirão (Pernambuco State, Brazil). The study was carried out in six areas. In each area it was collected 20 samples at 0-0.10, 0.10-0.20, 0.20-0.30, 0.30-0.40, 0.40-0.50 m - depth. Nematodes were classified according trophic habit in plant-parasites, fungivores, bacterivores, omnivores and predators and identified in level of genus or family. Nematodes communities were measured by the following parameters: fungivore/bacterivore (FF/BF) ratio, fungivore+bacterivore/plant-parasite (FF+BF)/PP ratio, Simpson's dominance index (λ), evenness (J'), species richness (SR), trophic diversity (T), maturity index (MI), plant-parasite index (PPI) and Shannon-Weaver diversity index (H'). The data were submitted to ANOVA statistical analysis at 5% level of Tukey's test. There were no differences in eight ecological measurements (FF/BF), (FF+BF)/PP, λ, J', SR, T, MI, PPI and the areas with or without vinasse application and Atlantic Forest but there were differences in the ecological index H' and the areas discriminating the studied ecosystems. The predominant decomposition channel FF/BF in Atlantic Forest was dominated by bacteria in contrast to dominance of fungi in sugarcane areas.

S05.P.39

PROPOSAL FOR OPTIMIZATION OF FOREST RESTORATION IN DEGRADED AREAS IN THE BRAZILIAN ATLANTIC RAINFOREST

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The demand for forest restoration projects has grown because of environmental compensation requirements, rehabilitation of permanent preservation areas and legal forest reserves, as well as landowners interest in recovering their properties through the implementation of voluntarily environmental recovery projects. Currently, state environmental agencies and institutions of southeastern Brazil require the use of a large diversity of species in forest restoration projects. The objective of this study is evaluate the effectiveness of current models and propose methodology for reforestation in the Brazilian Atlantic Rainforest, through the use of primarily zoochoric, fruit-giving, pioneer tree species, as well as attractions for birds. This study is based on a survey conducted in the Parque Natural Municipal Fazenda Atalaia (PNMFA) Macaé, Rio de Janeiro, where 49 seed collectors (0.90 m x 0.90 m) were installed at 5, 15 and 35 m from the forest edge and 5 m into the forest, with 21 of these collectors installed under artificial perches. The diaspores and feces of the birds were collected for one month. A total of 1,126 seeds were collected, among these, 939 (83.4%) are considered zoochoric and 187 (16.6%) anemochorous. Thus, in general, forest restoration using fast-growing, zoochoric pioneer species, along with procedures that attract wildlife, accelerates the recovery of ecosystems and increases diversity, favoring gene flow between remnants forest areas.

Keywords: Brazilian Atlantic Rainforest, Recovery of Degraded Areas, Diversity, Wildlife.

Financial support: This study was implemented to optimize the reforestation and reclamation programs developed by HABTEC Engenharia Ambiental.

S05.P.40

Beta diversity of tree species in different forest formations of southern Brazilian Atlantic Forest

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Beta diversity is defined as the variability in species composition between sites for a given area. Defining patterns of beta diversity throughout a region is essential to support strategies for biodiversity conservation and management. This approach is especially interesting when applied to heterogeneous forests with high species diversity, such as the Brazilian Atlantic Forest. This work aims to evaluate if different forest formations in the Atlantic Forest differ in terms of beta diversity. We collected information from the literature for tree species from 38 sites, including three different forest formations from the southern limit of the Atlantic Forest: Atlantic Rainforest (16), Araucaria Forest (12) and Seasonal Forest (10). We used two matrices, density of individuals and presence-absence of species per site, to evaluate the beta diversity through multivariate dispersion analysis. Results showed that forest formations did not differ in beta diversity, despite differences in alpha diversity. The average dissimilarity, based on density data, were 0.52 in Atlantic Forest, 0.50 in Araucaria Forest, and 0.54 in Seasonal Forest (P= 0.65), whereas for presence-absence dissimilarity were 0.45, 0.43 and 0.38 (P= 0.21), respectively. Alpha diversity revealed a greater richness in the Atlantic Rainforest (245 species) in comparison to Araucaria Forest (99) and Seasonal Forest (131). However, our results showed similar variation in species density and composition within each formation, which should deserve equal attention for conservation efforts. Araucaria and Seasonal Forests have been suffering high pressures from agricultural expansion and are less represented by conservation units. Most of the conservation units at the southernmost state are limited to the northeast region and prioritize Atlantic forest and part of Araucaria forest. Areas of Seasonal and Araucaria forests should also be considered in conservation plans since they show important variation patterns of tree species composition.

S05.P.41

Climate change threatens protected areas in the Atlantic Forest Biodiversity Hotspot

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The Atlantic Forest holds 18% of all South American amphibian species. Climate change is a threat to this enormous biodiversity and scientists concern about the effectiveness of protected areas (PAs). To evaluate PA effectiveness under climate change we produced consensus species distribution models for 431 amphibians both for current climate and for the year 2080. We generated a null model to evaluate how the climatic suitability of PAs behaves in comparison to various sets of PAs randomly located in the region. We also built two predictive models based on PA features (e.g. area size, altitude) to explain how much species a PA would win or lose due to climate change and its current spatial location. We found that, by 2080, 11.6% of the species inhabiting the Atlantic Forest would lose suitable climates within PAs. Projections also indicate that nearly half of the currently established PAs would become climatically unsuitable at rates higher than expected by a random distribution of reserves. Most PAs located in lowlands would loose species, mainly due to an increase of at least 3.2ºC, whereas mountainous PAs (i.e. above 336 m) and those less isolated are expected to gain species given the high variability in precipitation they are subjected and their connection to other PAs. Climate change will certainly rearrange species distribution along the current network of PAs leading to a decline in the number of species inside Atlantic Forest PAs. Our models provide a tool for predicting what features should be avoided while establishing new PAs in a reserve network.

S05.P.42

SPATIAL MODELING OF THE SEED FLOW FOR *Hymenaea courbaril* IN A FRAGMENTED LANDSCAPE AT PONTAL DO PARANAPANEMA, BRAZIL

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The conservation planning at very fragmented landscapes such in the Atlantic Rainforest Biome may be supported by contemporary gene flow data. We studied spatial genetics of *Hymenaea courbaril* in the Pontal of the Paranapanema São Paulo State, Southeastern Brazil. The study area has 49km^2 where more than 90% is covered by pasture over deforested land, which is very usual in this biome, and less than 10% is covered by five degraded forest patches that shelters subpopulations of *Hymenaea courbaril*. We censused adult trees; seedlings and juveniles were regularly sampled. A total of 359 individuals were identified and georreferencered by GPS and genotyped by SSR. We applied a maternity test, and from a total number of 264 seedlings and juvenile trees, 62 young plants had them mothers identified, we found 43 short distance seed flow events; and 19 long distance seed flow events across the pasture matrix. The distribution of distances indicates that the isolation for recolonization between subpopulations occurs in distances greater than 1,600m, indicating that the connectivity in the studied landscape is very low for *H.courbaril*. Applying this distance over a land cover map of the entire region of Pontal do Paranapanema, we found that the 169 habitat patches may be divided in 48 isolated groups, if any of those groups suffers a local extinction of *H.courbaril* the natural recolonizarion would be very improbable. This situation would be drastically changed if the legal requirement of forest restoration and conservation along the rivers was respected. At this “partial legal scenario” (just regarding the riparian corridors) only 13 habitat patches (8%) remains in isolation after the required restoration. This result emphasized the relevance of the forest restoration in the riparian corridors, despite the political trend for dissolving riparian-corridor protection that got very strong in Brazil at the present decade.

S05.P.43

Keystone species as indicators of intact food webs in a biodiversity hotspot

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Large apex vertebrate predators control populations of herbivores and herbivores control populations of plants; together they influence the structure and dynamics of entire food webs. Local extinction of those keystone elements translates into loss of ecological processes and long-term degradation of ecosystems. Here we propose to map current distribution of four keystone mammal species, all highly vulnerable to anthropogenic pressure, in a biodiversity hotspot, the Atlantic forest. Presence of all four species can be used as indicators of areas with intact food webs and healthy ecosystems. We will map areas where the largest top predator (*Panthera onca*), the largest herbivore (*Tayassu pecari*), the largest arboreal frugivore (*Brachyteles* sp. or *Alouatta* sp. where *Brachyteles* does not naturally occur), and the largest terrestrial frugivore (*Tapirus terrestris*) still occur sympatrically. Furthermore, we will use a consensus model of species potential distribution with recent presence records, bioclimatic layers, altitude, and landscape layers, such as percentage of vegetation cover, as explanatory variables. Preliminary results suggest approximately 30 localities where at least one of keystone indicators still occurs, most areas with large tracts of continuous forests (at least thousands of hectares). But only in three areas all four species still occur sympatrically, indicating that more than large tracts of continuous forests are necessary to preserve intact food webs. Preliminary modeling results for *T. pecari* corroborate the importance of vegetation cover for the species occurrence with percentage of vegetation as the most important variable to explain its presence. Nevertheless, besides high model predictability power, it also predicted areas where the species does not currently occur. Protecting and connecting large tracts of forest is fundamental to maintain intact food webs. But other actions, such as reintroducing species and reducing poaching, will also be necessary to guarantee long-term ecosystem conservation in large areas where key elements are already missing.

S05.P.44

Differential productivity, phenology and NDVI in preserved subtropical forests of Northern Argentina: the importance of an endangered tree species for the functioning of a forest ecosystem

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Aspidosperma polyneuron is an emergent evergreen tree in the semideciduous Atlantic Forest. Due to its high commercial value the abundance of this species has declined dramatically in the last century, while its effective distributional range has been reduced by changes in land use with the conversion of forests into agricultural land. Selective logging of *A. polyneuron* and other commercial species has changed light dynamics generating environmental conditions that favor the growth of fast growing native plants (e.g., bamboos and lianas), which become invasive after selective logging and inhibit tree regeneration. We measured tree basal area and the percentage solar radiation reaching the understory in forest areas dominated by *A. polyneuron* and in areas where this species is absent as a consequence of past logging activities. Through satellite image analysis (Landsat ETM+) we determined differences in NDVI among *A. polyneuron* dominated stands and surrounded native forests throughout the year. Most canopy trees in this forest ecosystem are deciduous but this evergreen species is able to change micro environmental conditions reducing solar radiation in the understory to very low values and potentially drive water, nutrient and carbon cycling as account for more than 60% of the above ground tree biomass in preserved forests. We propose that differences in NDVI due to phenology and seasonality could be used for mapping the distribution of forest stands dominated by this endangered species in NE Argentina.

S05.P.45

Urticalean clade in the Atlantic Forest: endemism and conservation

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Atlantic Forest is included by IUCN in the list of biodiversity hotspots. Unlike most tropical forests, the Atlantic Forest has a set of geographic and climatic variables that makes it unique. Originally extending for 1.300.000 km along the Brazilian coast and reaching into Paraguay and Argentina, approximately only 14% of primary forest remains currently intact. The study of Urticalean clade in the Atlantic Forest aims to meet the taxa that present this biome and contributes to their conservation. Urticalean clade in South America is formed by the families Moraceae, Urticaceae, Ulmaceae and Cannabaceae, inserted in the order Rosales and comprises about 110 genera and approximately 4000 species in the world. This group presents particular diagnostic characters such as the presence of cystoliths, small and inconspicuous flowers with bicarpellate gynoecium, unilocular ovule, basal or apical placentation and differentiated trichomes. In Atlantic Forest, Urticalean clade is represented by 25 native genera with 149 species, of which 53 are endemic of this biome. Among the genera with the greatest number of endemic species are *Dorstenia* (24) and *Ficus* (10). The others genera are represented by *Sorocea* (4), *Brosimum* (2) of Moraceae; *Pilea* (6), *Coussapoa* (2), *Cecropia* (1), *Urera* (1), *Urtica* (1) of Urticaceae and *Celtis* (2) of Cannabaceae. For the first time, all species of Urticalean clade are placed in conservation categories - Red List, for the Atlantic Forest, according to IUCN criteria in this study.

S05.P.46

Atlantic Rainforest Fragmentation Analysis and Landscape Restoration Management Scenarios

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The intensification of anthropogenic action in recent decades has dramatically changed the natural environment. Natural habitat loss and fragmentation are currently major threats to biodiversity conservation. Continuous natural regions have been segmented into small patches of low quality habitat, with low connectivity and high resistance to an individual's dispersion. Landscape Ecology enables us to analyze the configuration of different types of landscapes, create management scenarios for their restoration, and contribute to deciding on strategies for conservation. Thus, this study aimed to analyze the fragmentation of the Atlantic Forest and to create landscape management scenarios for the municipality of Carmo de Minas, Minas Gerais State, Brazil. Landscape metrics, including percentage of forest cover, number of patches, mean patch size area, larger patch index, and mean nearest-neighbor distance were used to assess the fragmentation process of the study area, which has a history of agricultural use. Management scenarios were modeled to represent the potential restoration of the environment based on the behavior of the natural vegetation units. The first scenario was based on the incorporation of secondary forests (vegetation/secondary forests – VSF), and the second was based on the incorporation of reforested permanent protected areas (vegetation/permanent protected areas – VPPA). The natural vegetation in the study area is highly fragmented, and the integrity of its remnants is severely threatened.The management scenarios showed how the restored natural units behave in the landscape as well as the isolation and connectivity between them. Both scenarios presented an increase in the area of natural vegetation and mean patch size area, while patch number and patch isolation was significantly reduced as a result of the incorporation of new areas.Two important actions for the conservation of the remaining natural vegetation were identified: the maintenance of secondary forest and the restoration of permanent preservation areas. The models used in this study enable us to predict future landscape dynamics.

S05.P.47

Spatial distribution of three palm species in fragments of Brazilian Atlantic Rain Forest

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The spatial distribution of plants reflects the combined effects of various ecological forces and biological requirements. However, the kind and degree of dispersion can vary throughout ontogenetic stages both within and among species. Using palms as the object of study, can be a useful tool to understand how fragmentation may influence the spatial patterns of each stage. Here, we compared the spatial distribution of three tropical palm species, *Astrocaryum aculeatissimum* (Schott) Burret, *Euterpe edulis* Mart. and *Geonoma schottiana* Mart., in two fragments of different sizes (57 ha vs 3500 ha) in the threatened Brazilian Atlantic Rain Forest. Palms were censused in nine 30 x 30 m plots in the two forest fragments once a year from 2005 to 2007, from June to September. Each individual was assigned to one of the pre-established ontogenetic stages, which differed among species. The degree of clumping in each stage was determined by the Morisita index of dispersion and the statistical significance of each index was tested with the statistic χ^2. The spatial distribution of each species was, in general, clumped, except for *E. edulis* in the smaller fragment, which was randomly distributed in the three study years. This distinct observed pattern of distribution could be a result of human exploration of its palm heart. *Astrocaryum aculeatissimum*, showed no such differences between the fragments, which could be explained by its generalist habitat and biological requirements. *Geonoma schottiana*, however, showed a more aggregated pattern in the smaller fragment, possibly due to its preference for humid places. Finally, the main point to be drawn from the results found in this study is that the spatial distribution response of palm individuals to a habitat reduction seems to be highly dependent on the natural history of the species and on the type of harvest.

S05.P.48

SEED DISPERSAL AND INVASIVE PLANT SPECIES IN THE DIET OF A CRITICALLY-ENDANGERED PRIMATE IN THE ATLANTIC FOREST

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Capuchin monkeys (*Cebus* spp) have a varied diet and a flexible use of food resources for their cognitive skills and variation in morphological traits among different species. In the northern Atlantic forest, hunting and habitat loss have reduced animal densities and wiped out a number of large mammals that disperse zoochoric fruits. With the decrease in populations of other seed dispersers, yellow-breasted capuchins are currently one of the largest fruit-eating mammals in the region. We aimed to verify the effectiveness of *C. xanthosternos* as seed dispersers by estimating dispersal based on gut retention time of seeds. In addition, we estimated the quality of dispersal calculating the percentage of seeds moved to a distinct vegetation type from the source tree. Moreover, we provide frequency of feeding on invasive species (jackfruit, oil-palm and cocoa) and insights into how they might compete for seed dispersal by yellow-breasted capuchins. *C. xanthosternos* had a high frequency of travelling and feeding on fruits. They ate fruits in primary, old- and young-secondary forest, swamp and *cabruca* (shaded cocoa plantation). Seeds were dispersed long distances. In addition, they fed on fruits of oil-palm (*Elaeis guineensis*), jackfruit (*Artocarpus heterophyllus*) and cocoa (*Theobroma cacao*); these compete with native species for seed dispersal by *C. xanthosternos*. We confirmed the importance of seed dispersal by capuchin monkeys and we recommend the management of invasive fruiting species, especially in protected areas.

S05.P.49

Palm Recruitment in Atlantic Forest Fragments: Understanding the Consequences of Empty Forests

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Defaunation usually leads to the disruption of ecological interactions, resulting in changes on plant demographic processes. Because palms are highly dependent on vertebrates to disperse their seeds, the loss of animals in tropical forests can dramatically affect seed dispersal and predation, with implications for maintaining biodiversity. In this study, our expectation was that the palms *Astrocaryum aculeatissimum*, *Attalea humilis* and *Euterpe edulis* should be negatively affected by defaunation in this decreasing order, expected from their different sets of seed dispersers. The hypothesis tested was that small defaunated fragments should have reduced seed dispersal, greater predation by invertebrates and reduction in seedling recruitment, with shortened recruitment distances. Adult palms were selected in small fragments (<350 ha), considered as "empty forests", and in large non-defaunated fragments (>2500 ha) in order to compare the abundance of seeds remaining beneath parents, seed shadow, seed predation by invertebrates and rodents, and the abundance and distribution of seedlings in relation to the parent palms. The results confirmed that the palms were affected differently by defaunation, but their responses were more diverse than expected. In small fragments, *A. aculeatissimum* had reduced seed dispersal and higher predation by bruchines, leading to lower seedling abundance, but without changing recruitment distances. *A. humilis* had lower seed dispersal and predation, which led to retracted recruitment distances, without changes in seedling abundance. For *E. edulis* no difference was found in seed dispersal, seed predation and seedling abundance between small and large fragments; however, recruitment distances were dramatically reduced in small fragments. This study showed that defaunation leads to profound changes in the complex web of ecological interactions, with negative effects on seed predation and dispersal of palms, but that individual characteristics of plants may either dilute or boost the negative effects on seedling recruitment.

S05.P.50

Variation on functional groups of plants at a gradient of defaunation in the Atlantic forest

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Atlantic forest remnants have been experiencing high levels of anthropogenic activity that reduce populations of large mammals. Defaunation may affect plants' reproductive success, and it is expected that in defaunated areas, there will be non-random changes in plant composition. The present study was conducted in three areas that represent a gradient of defaunation: high (Serra do Mar State Park – Vargem Grande Base, São Paulo, hereafter VG), medium (Serra do Mar State Park – Itamambuca Base, São Paulo, hereafter IT) and low (Carlos Botelho State Park, São Paulo, hereafter CB). Our main objective was to identify non-random changes in composition of plants, with respect to seed size and dispersal syndrome, that could relate to changes in large-mammal composition. We set 15 20x20-m plots in each area. In each plot, we sampled all individuals with PBH ≥ 30 cm and sub-sampled all individuals with PBH < 30 cm and higher than 1 m in 10x10-m sub-plots within each main plot. Overall, we sampled 1658 individuals at CB (low defaunation – 469 adults and 1189 juveniles), 1989 at IT (medium defaunation – 555 adults and 1434 juveniles) and 2503 at VG (high defaunation – 754 adults and 1749 juveniles). Arecaceae, Myrtaceae, Lauraceae, Rubiaceae and Fabaceae were the most common families and *Euterpe edulis* was the most abundant species in all three areas. Plants with bird-dispersal syndrome were most common in all areas, followed by mammal-dispersed plants. Nevertheless, CB (least-defaunated area) presented higher proportions of mammal-dispersed plants. As for seed size, small-seeded plants were most common in both groups (adults and juveniles) and in all three areas, but with higher proportions at VG (most-defaunated area). Differences in dispersal syndromes and seed size between areas may be a response to differences in defaunation level, but also a response to history of perturbation (or a combination of both).

S05.P.51

Does edge effect alter the outcome of an ant-plant mutualism in the Atlantic Forest?

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Habitat loss and the creation of artificial forest edge have the potential to alter the biological composition of an ecosystem, leading in changes of the biotic interactions. Extrafloral nectaries (EFN) are specialized nectar-secreting glands evolved to attract ants that protect plants against their natural enemies. However, this mutualistic interaction is facultative, and it can respond to the light, herbivores damages and ants presence. Here, we experimentally investigated the influence of forest edge on the interaction between *Inga edulis* and its associated ants. From March to November 2010, 1600 juvenile transplanted plants were grown along eigth edge-to-interior transects established in a fragment (3500 ha) of Atlantic forest. We assessed ant visitation, herbivory damage and plant performance (i.e. survival and growth). The experiment followed a two-factor randomized blocked design where treatments were: ant (presence and absent) and distance from edge (0 m, 50 m, 100 m, 150 m and 200 m). We collected a total of 441 EFN-visiting ants. The mean number of EFN-visiting ants did not change from edge-to-forest interior. In the same way, herbivory damage was similar among different distances from edge and between plants with and without ants. However, plant survival and growth decreased along the edge-to-forest interior gradients, but without differences between plant with and without ants. Our study demonstrated that ants are using plant resource without provide protection to EFN-bearing plants. We propose that I survival and growth of *I. edulis* individuals are more affected by edge proximity, than by the presence of both EFN-visiting ants and herbivores.

S05.P.52

Seasonal variation in rainfall decreases photosynthetic pigments in three restinga vegetations of Southeast Brazil

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The restinga is a physiognomically diverse vegetation type that grows under the influence of a series of environmental factors, including water limitation. Variations in water availability can affect nutrient cycling in these ecosystems, reflecting in morphophysiological changes that can influence the process of photosynthesis, affecting plant community productivity and ecosystem functioning. We analyzed and compared the effects of water availability variation in the photosynthetic pigments of three restinga sites of Southeast Brazil. Samplings were carried out in April 2010 (end of rainy season) and September 2011 (end of dry season) at the *Massambaba* Environmental Protection Area (RJ); Restinga of *Jurubatiba* National Park (RJ); and Serra do Mar State Park, *Picinguaba* Nucleus (SP). The formations have distinct physiognomies, and grow under differentiated water regimes (mean annual precipitation of 800, 1,200 and 1,600 mm, respectively). Leaf discs (2.01 cm^2) were punched from the leaves of the most representative species in each site. Leaf discs were immersed in ethanol 96 % and stored in dark containers. After mechanically ground, samples were homogenized and centrifuged. From the extract obtained, the concentrations of chlorophylls (*a*, *b* and total) and carotenoids, as well as their ratios were determined with a spectrophotometer. During the dry season, the three areas showed lower rainfall, and estimated water shortage was more severe at the restingas of *Massambaba* and *Jurubatiba*. This seasonal variation was associated with a reduction in Chl *b* and total *Chl* concentrations and, consequently, an increase in *Chl a/b* ratio (at *Massambaba*). Simultaneously, reduced carotenoid concentration and increased Chl/Car were observed at *Jurubatiba*. These results are an indicative that reduced rainfall, in association with high solar irradiation, caused a reduction in the photosynthetic capacity of light absorption, what may adversely influence carbon allocation and plant survival.

S05.P.53

Soil-mediated effects on potential Euterpe edulis (Arecaceae) fruit and palm heart sustainable management in the Brazilian Atlantic Forest

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Euterpe edulis is an endangered species due to palm heart overharvesting, the most important non-timber forest product of the Brazilian Atlantic Forest, and fruit exploitation has been introduced as a low impacting alternative. However, *E. edulis* is a keystone species for frugivores birds, and even the impact of fruit exploitation needs to be better investigated. Since this species occurs over contrasting habitats, the establishment of site-specific standards and limits for exploitation may also be essential to achieve truly sustainable management. In this context, we sought to investigate how soil chemical composition would potentially affect *Euterpe edulis* (Arecaceae) palm heart and fruit sustainable management. We studied natural populations found in Restinga Forest and Atlantic Rainforest remnants established within Natural Reserves of São Paulo State, SE Brazil, where we evaluated soil chemical composition and diameter at breast height of *E. edulis* individuals. Additionally, we evaluated fruit yield in 2008 and 2009 in 20 individuals per year. The Atlantic Rainforest population had a much higher proportion of larger diameter individuals than the population from the Restinga Forest, as a result of habitat-mediated effects, especially those related to soil. Sodium and potassium concentration in Restinga Forest soils, which have strong negative and positive effect on palm growth, respectively, played a key role in determining those differences. Overall, the number of fruits that could be exploited in the Atlantic Rainforest was four times higher than in Restinga Forest. If current rules for palm heart and fruit harvesting were followed, Restinga Forest populations would not be suitable for sustainable management of both fruits and palm heart. Hence, a habitat-specific approach of sustainable management is needed for this species in order to respect the demographic and ecological dynamics of each population to be managed.

S05.P.54

Combining Ecosystems Services Protection and Biodiversity Conservation in the Atlantic Forest of Brazil

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The growing trend of payments for ecosystem services can potentially create new opportunities for biodiversity conservation. Mapping these services has been listed as a key element required to increase recognition and implementation of ecosystem services markets into decision-making. Nevertheless, priority areas for ecosystem services do not always overlap with priority areas for biodiversity conservation, what can lead to trade-offs between human well-being and native species conservation across productive landscapes. Systematic conservation planning, provides insight into where, how and when limited resources should be allocated to maximize the achievement of defined goals (such as the protection of biodiversity or water provision). In this study, we assess the synergies and trade-offs between biodiversity and ecosystem services protection in the Atlantic Forest, one of the top five global biodiversity hotspots. Housing around 75% of the Brazilian population and providing numerous ecosystem services, the Atlantic Forest is considered one of the most endangered ecosystems in the world. We are developing spatial models of carbon stocks, water, and the distributions of endemic species to identify sites that, if put under a conservation plan, would efficiently conserve both biodiversity and ecosystem services. Large scale studies carry uncertainties and might have errors due to the heterogeneity across landscapes and might raise concerns regarding the development of policies and conservation measures based on imprecise outputs. Thus, we are ground-truthing our models through field inventories at a fine spatial scale in different agricultural landscapes. In parallel, we are developing a meso-scale model in São Paulo state along with the large-scale model across the entire Atlantic Forest biome. We will present the link between the three scales of the project. Insofar as deforestation in the AF is similar to land conversion in other biodiversity hotspots, we expect our methodology to be applicable to conservation efforts elsewhere in the world.

S05.P.55

Dung beetle communities and habitat complexity in different successional stages of Atlantic rain forest in the south of Brazil

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Dung beetles (Scarabaeinae subfamily) play important ecosystem functions feeding on decaying organic matter and are considered ecological indicators due to their communities changes in environments altered by human influence. The objective of this study was to analyze the communities of copro-necrophagous Scarabaeinae in areas of Atlantic Rain Forest with different successional stages, relating them to environmental complexity. Samples were collected twice between Nov/2009 and March/2010 in three sites in Santa Catarina state, south of Brazil: two sites in the Parque Estadual da Serra do Tabuleiro - PEST and one site in the Reserva Particular do Patrimônio Natural Chácara Edith - RPPN. In each of these sites baited traps were installed: 10 in conserved forest areas, 10 in intermediate and 10 in early sucessional stage areas. The environmental complexity was analyzed by the method of point-quadrant adapted, where at each point height, DBH/DAH and crown diameter for the nearest trees (DBH> 5 cm) and shrubs (> 1 m height) were measured; other environmental variables, like height of the litter, canopy cover and frequency of bromeliads were also measured. We collected 3,049 individuals of 29 species: 1,196 individuals of 23 species in the area 1-PEST, 1,067 of 23 species in the area 2-PEST, and 786 of 16 species in RPPN. The communities have tended to reduce diversity in early sucessional stages compared to later stages and were positively correlated with tree height, frequency of bromeliads and canopy cover; the height of the litter and the basal area of shrubs were also important. The high beta diversity calculated, even between geographically close communities, was impressive. Four species were identified as indicators of conserved forest and two of early stages and the genus *Deltochilum* stood out. These results are important for understanding the dynamics of ecological succession and conservation planning at the landscape level.

S05.P.56

Is there a relaxation on distance-dependent seed predation in small fragments of Brazilian Atlantic forest?

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The high mortality of seeds near conspecific adult trees has been considered an important mechanism to maintain tree diversity in tropical forests. However, this mechanism may be weaker in small forest fragments, where some tree species such as *Tapirira guianensis* present abundances three times higher than in adjacent mature forest areas. We conducted a field experiment with *T. guianensis* in a fragmented landscape of Brazilian Atlantic forest to test if distance to conspecific tree has a weak or no effect on seed predation in small forest fragments. We selected 39 trees of *T. guianensis* in two habitat types: small forest fragments (<100 ha) and mature forest areas. A total of 3510 seeds of *T. guianensis* were placed near (1m) and far (15 m) from the conspecific trees. In both distances seeds were placed in three types of exclosure plots: complete access (access by vertebrates and insects), semi-access (access by insects only) and no-access. We recorded seed fate monthly for four months. We detected no influence of distance to conspecific tree on seed predation in both habitats, as 78% were predated in both distances from the conspecific tree. As expected, seeds were predated faster in complete access plots, followed by semi-access and no-access plots. We detected no between-habitat differences in seed predation in complete access plots, but seeds in semi-access plots were predated faster in small fragments than in mature forest areas. We concluded that the higher abundance of *T. guianensis* in small fragments is not a result of a relaxation on distance-dependent seed predation once we did not observe any influence of distance to conspecific tree on seed predation in both habitats. Vertebrates and insects that predate seeds of *T. guianensis* apparently are present in both habitats and our results indicate a higher seed predation by insects in small fragments.

S05.P.57

Allometric relations of the sub-canopy tree Bathysa australis (A.St.-Hil.) & Hook. in an Atlantic Tropical Rain Forest of SE Brazil

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Allometric relations between trunk diameter and tree height can be defined by plant growth and its interaction with environmental factors. This study evaluated allometric relationships of stem diameter with tree height in populations of *Bathysa australis* (Rubiaceae) at two altitudes. We expect that these contrasting environments, with different light availability and wind exposure, will influence *B. australis* allometric relations in a different way. The study was performed at the Atlantic Tropical Rain Forest of Serra do Mar state park and sampling consisted of three 1ha plots in the upper forest (1,000m a.s.l.) and three 1ha plots in the lower forest (100-200m a.s.l.). All individuals were measured for trunk height and diameter at ground level. They were also classified into size categories: small (height<1m), intermediate (1≤height≤5m) and large (height>5m), since we expect different growth strategies to emerge at different sizes. We also tested for stem diameter-height fit to three mechanical models (geometric, elastic, and stress similarity), an attempt to verify if *B. australis*, as a sub-canopy specie with large leaves, adjusts to the elastic similarity model. All lines were fitted using standardized major axis method. Smaller individuals fitted for the geometric model (b ~ 1) in both altitudes showing that at this phase height growth in search of light is a priority at both environments. Line-fitting slopes than reduced with size following the need for more stability. However, only at the upper forest, larger individuals fitted for the elastic similarity model (b ~ 0.67). The upper forest also presented higher slopes than the lower one for large (upper: b = 0.65 and lower: b = 0.55) and overall individuals (upper: b = 1.13 and lower: b = 1.05). We conclude that altitude is a major factor influencing allometry, as from a certain size growth trajectories change between these two environments.

S05.P.58

Effect of forest distance and nurse Araucarias on expansion of Araucaria Atlantic forest over native grassland in southern Brazil

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With 2.5 % of original Araucaria Atlantic forest remaining, a biodiversity hotspot, conservation of remaining patches in southern Brazil is of great importance. Recent evidence of past and current forest expansion over natural and disturbed grasslands supports conservation of these two ecosystems and their matrix mosaic state. As a recent finding, the expansion process is still poorly understood, particularly how distance of forest border influences establishment of trees and seedlings under nurse Araucarias and in open grassland. We investigate how distance from forest border, and presence of nurse Araucaria trees affect forest expansion of tree and seedling communities in an Araucaria (Ombrófila Mista) Mata Atlantica -grassland transition. The study was performed at Estação Ecológica de Aracuri, RS, Brazil, a 272 ha reserve of native Araucaria forest and grassland with cattle exclusion for 34 years with woody forest species establishing the grassland. A total of 45 sampling units of 28 m^2 were sampled both under nurse Araucaria trees and in open grassland, describing abundance of tree (> 1m height) and seedling (0.2-1m) communities, along with tree cores for tree aging. We used Path Analysis to develop a top-down causal model of distance from border influencing Araucaria age ($P = 0.0024$) and basal area (BA) ($P = 0.0152$) but not tree ($P = 0.33$) or seedling ($P = 0.55$) composition (PCA axis 1 scores; 34 and 51 % variance explained, respectively)) nor richness (tree: $P = 0.39$; seedling: $P = 0.08$). Presence or absence of Araucaria nurse tree showed the strongest positive effects on seedling composition ($P = 0.021$) and richness ($P < 0.001$) and tree richness ($P < 0.001$) but not tree composition ($P = 0.74$). Our results suggest strong distance effects on Araucaria trees, with nurse effects from Araucarias defining seedling communities and adult tree richness in the expansion process.

S05.P.59

Optimizing the evaluation of plant diversity in the tropics: a test with Atlantic Forest palms

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Estimating species richness along environmental gradients is of key importance to both basic and applied aspects of ecological studies. However, quantifying plant richness in the tropics might take a long time due to the high species diversity. Herein, we compared the efficiency of a variable and a fixed sample method for assessments of plant richness using palms as a model of study. Twenty plots were established in the threatened Brazilian Atlantic Forest. In variable-area method, plot length were measured at the 6th adult position, or when less than 6 individuals were observed in the maximum plot length of 30 m, we extended the plot length to 50 m to search for additional individuals. In all cases, the width of plots was 10 m. In order to test the efficiency of the variable-area method, additionally to the individuals found in the variable-area plots, we also measured all reproductive palm individuals within 30 m length fixed-area plots. The efficiency of both methods was compared through species rarefaction curves, using Chao 1 (for abundance data) at EstimateS 8.20. A total of 11 palm species (118 individuals and 2624 m^2 sampled area) in five genera were sampled using variable-area method, while 12 palm species (470 individuals and 6000 m^2 sampled area) in six genera were sampled using the fixed-area method. All species were sampled in both methods, except for a single *Attalea dubia* individual that was sampled only in the fixed-area method. An asymptote in Chao estimator of species richness was achieved in both methods, but in variable-area plots 4-fold fewer individuals were necessary to characterize maximum species richness. Moreover, variable-area plots, since its faster assessment of palm richness, should increase spatial sample representativeness by spreading a higher number of plots at different spatial scales. Thus, we find enough evidence to propose the variable-area plot method for a rapid and robust evaluation of palm richness in a tropical forest.

S05.P.60

Invasion of domestic dogs in two Atlantic forest fragmented landscapes with different proportions of remaining forest.

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Domestic dogs are known to invade areas of native vegetation and impact wildlife through competition, predation and disease transmission. Given that human-altered environments are more susceptible to invasions, the intensity of invasion by domestic dogs should be higher in forest remnants in intensely fragmented landscapes. In this study we compared the number of individuals (permutation test), the frequency distribution of the number of visits among individual (Kolmogorov–Smirnov test), the time of visits (Rayleigh test) and the proportion of visits made by groups of dogs (Chi-square test on a contingence table) between two Atlantic forest landscapes with different degrees of habitat loss (~10% and ~50% forest cover). In each landscape we sampled 24 forest remnants with three camera traps installed for three 15-day periods, and individuals were identified in the pictures. Although the total number of dogs that entered remnants was higher in the less forested landscape (57 individuals compared to 35), the mean number of individuals per remnant and the frequency distribution of the number of visits among individuals did not differ significantly between landscapes. Moreover, no significant association between the proportion of visits in groups and landscape fragmentation was detected. However, while the time of visits was distributed uniformly throughout the 24-hour period in the more forested landscape, it was concentrated during the day, at ~13:00, in the less forested landscape, suggesting a greater coincidence with the period of human activity. Results suggest that habitat loss and fragmentation affect mainly the behavior, especially the time of visit to forest remnants, rather the number of invading dogs. The high total number of dogs detected inside remnants in both landscapes also corroborates the potential threats imposed by this exotic species on wildlife.

S06.OC.01

Floristic and structural aspects of seasonally flooded forests in the Pantanal and relations with flood pulse and fire.

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Flooded forests have been attracting attention in the last decades from researchers. Particularly in Brazil now the protection laws are under discussion for a revision and we have to provide scientific information to subsidize conservation of these environments. In the Pantanal the flooded forests are spread in all extension of the floodplain, almost always associated with water courses, such as permanent rivers and secondary channels locally known as "vazantes" and "corixos". On the riverbank there is a zonation of species related with time of inundation. On a macro level, the composition and structure of these forests can vary by function of time of inundation, soil type, water speed, dispersal strategy, successional state and frequency of fire in each basin. Many species like *Erythroxylum anguifugum*, *Alchornea castaneifolia*, *Ocotea diospyrifolia*, *Tabebuia heptaphylla*, *Albizia inundata* and *Andira inermis* can occur spread along all water courses of the region. Species like *Ruprechtia brachysepala*, *Zygia inaequalis*, *Banara arguta*, *Simira rubescens* are found at the lowest topographic levels of the flooded forests and consequently subjected to the highest time of inundation. Nevertheless, some species can be found mainly in less inundated areas, such as *Astronium fraxinifolium*, *Sapindus saponaria*, *Enterolobium contortisiliquun*, *Aspidosperma australe* and *Tabebuia impetiginosa* associated to soils with high natural fertility, and others like *Hirtella gracilipes*, *Licania humilis*, *Tapirira guianensis* and *Vochysia haenkeana* associated to sandy soils. Some species like *Vochysia divergens* can increase in number of individuals in a set of high inundation years, while others like *Attlalea phalerata* and *Celtis pubescens* can die when floods reach higher levels. The occurrence of fires is associated with years of low levels of floods. Fire can promote mortality of species like *V. divergens*, and benefit mainly species that can resprout afterwards, like *Myrcia fallax*, *Triplaris gardneriana* and *Inga vera*, and *C. pachystachya* regenerates from seed.

S06.OC.02

Environmental and Spatial Effects in the Richness of Trees and Shrubs in Meso-Scale Spatial, Pantanal, Brazil.

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Studies in small areas in the Pantanal have shown that the distribution of woody plants occur in most wanted habitat over the gradient flooding. The approach of the relative importance of environmental factors and geographical distance to woody plants is new and needs to be further elucidated. In this work we tested the following hypothesis: it is expected that in meso-scale the environmental variables are responsible for the variety of patterns in the richness of plant species and that they do not occur stochastically in the environment. The samples were collected in a system of permanent plots of 5x5 km² (Grade Pirizal) in the north Pantanal (16º15'S e 56º22'W). It was monitored the level (DHF) and duration of flood (DF), groundwater (GW) and measured the elevation and altitude of the soil structure (texture and color). To test the studied hypothesis, we developed multiple linear regression models depending on plant species richness. In the first model, the predictor variables, selected by Principal Component Analysis, were clay (0.82) and silt (-0.72), with DF, (0.73). That explained 29, 7% of the first axis. As to the second axis, the explained variance was 21.7%, and the variables that showed higher correlation with this component were DHF, (-0.69) and GW (0.76). The analysis showed that, by the selection criteria Aikaike, DF and clay content were the main predictors (AICC <1) for distribution of the richness of shrubs (R^2= 0.25 P <0.01) and tree (R^2=0, 49 P <0.01). Our initial expectation, that the environmental effects (represented by DF and clay) on the patterns of plant species richness would be stronger than the effects of geographic distance in meso-scale spatial were confirmed. The results suggest that the deterministic view is a more accurate representation for the richness of the group of woody plants than the neutralist view.

S06.OC.03

Distribution, richness and turnover patterns of Poaceae in the Pantanal of Poconé, Mato Grosso

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In the Pantanal, the Poaceae family has the greatest richness among herbaceous plants and great economic importance. The hydro-topographic variable can affect the distribution of its species. This study, made in the Pantanal of Poconé, aimed to answer questions about which species are the most widespread in the region, what influence seasonal changes may have and the microtopographics of the richness, coverage, distribution, turnover, life forms and photosynthetic paths of grasses. Data were collected using the RAPELD system and the point sampling method along 30 isolines 250m long, during the dry, flood and flooding runoff (*vazante*) periods. In total, 59 species were sampled, three of which are regionally dominant and showed little variation in coverage over the three periods. These are: *Axonopus purpusii, Brachiaria humidicola* and *Paspalum lineare*. The distribution and coverage of grasses were influenced by flood gradient as well as species richness which diminished continuously along the flood gradient. The beta diversity showed spatial and temporal changes in the species composition. The number of annual grasses, despite being low, was higher than that normally found in the Cerrado region and had greater coverage during the dry period along the isolines subject to greater flooding depths. The average coverage over the periods of the C3 species also showed a tendency to be higher in extreme conditions of dryness/shade and flooding. It is thus possible to conclude that this family is distributed along the whole flood gradient, but this affects the distribution and richness of grass species as it favours species with more adaptable characteristics that can tolerate the different stress intensities of this gradient.

S06.OC.04

Dendroecological studies of *Tabebuia aurea* and *Tabebuia heptaphylla* at the Pantanal of Mato Grosso State, Central-West Brazil

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The Pantanal in Central South America is one of the largest wetlands in the world. *Tabebuia aurea* and *T. heptaphylla* (Bignoniaceae) are two characteristic deciduous tree species growing in the seasonally flooded landscapes often forming monospecific stands. In this study we analyze tree-ring series of these species with the aim to construct chronologies and growth models to derive species-specific minimum logging diameters (MLD) and the cutting cycles. Therefore we collected stem disks and cores of 27 trees from *T. aurea* and 23 from *T. heptaphylla*. From all trees we measured diameter at breast height (DBH) and tree height. The transversal sections of the samples were polished to analyze the wood anatomical features of the tree rings. Afterwards, ring-width was measured to construct ring-width chronologies and cumulative diameter growth curves. By cross-dating techniques indexed tree-ring chronologies were constructed for both species comprising the period 1928–2010 for *T. aurea,* (11 trees) and 1759–2010 for *T. heptaphylla* (12 trees). The mean cumulative diameter growth curve was combined with a non-linear DBH-height relationship to produce volume growth models which allow the definition of the MLD (diameter corresponding to the age of maximum current volume increment) and cutting cycle (estimated by the mean passage time through 10 cm diameter classes until reaching the MLD). The MLDs vary between 50 cm for *T. aurea* and 40 cm for *T. heptaphylla.* The cutting cycles of both species was 31 years. Our results indicate that the current forest legislation which suggests a MLD of 50 cm and a cutting cycle of 25 years is not adequate to manage the timber resources of both species. The relatively high ages, distinct tree rings and the possibility of cross-dating indicate the potential of creating a network of tree-ring chronologies for the savannah belt (Cerrado) in Central-West Brazil.

S06.OC.05

Phylogenetic structure of Southern Pantanal plant communities

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The Pantanal comprises a vast alluvial floodplain in central South America. Climate is semi-arid with a marked dry season and one annual flooding pulse following the rainy season. Landscape is composed by permanent or temporary lagoons in terrain depressions, flooding fields in mid-elevated terrains, and semi-deciduous forests in highest, not flooded terrains. Here we examine the phylogenetic structure of plant communities across these three habitats (hereafter lagoons, fields and forests) to infer the role of competition and environmental filters in community assembly. We expected no effect of geographic distance and that annual flooding was the major force structuring lagoon and field communities, whereas competition was structuring forest communities. We sampled angiosperm species of 10 assemblages per habitat, in 4x10 m plots, one per site. We used the Net Relatedness Index (NRI) and Nearest Taxon Index (NTI) to infer the role of competition and environmental filters in each community. Positive NRI and NTI values indicate effect of environmental filters on community assembly. Conversely, negative values indicate effect of competition on community assembly. We recorded 218 species of angiosperms belonging to 168 genera and 64 families. Forests were richer than fields and lagoons (mean plant species 34.5, 18.3 and 18.8, respectively). Mean NRI and NTI were respectively, -0.211 and 0.962 for lagoons, 0.008 and 1.088 for fields, and -0.707 and -1.438 for forests. There was no difference of NRI among habitats, and only forests presented values significantly lower than 0. Consistently to our expectation, NTI differed among habitats, as forests presented significant negative values and lagoons and fields showed significant positive values. Mantel tests showed no relation between geographic distance and phylogenetic diversity. Our results indicate that competition likely shapes plant assemblages in forest habitats, but annual flooding imposes environmental filters which drive plant assembly in lagoons and fields of the Southern Pantanal.

S06.OC.06

CATTLE IMPACTS ON FOREST UNDERSTORY PLANT COMMUNITIES OF THE PANTANAL

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The Pantanal of central-western Brazil, eastern Bolivia, and northeastern Paraguay is a huge alluvial plain (210,000 km^2) that drains the headwaters and tributaries of the Upper Paraguay River. It encompasses a complex mixture of tropical forest, savanna, and aquatic environments adapted to highly variable annual floods. More than 95% of the Brazilian Pantanal is comprised of privately-owned cattle ranches and farms. Deforestation and conversion of native habitats to exotic pasturelands, and inadequate agricultural and cattle management practices have placed great pressures on the flora, fauna and natural resources of the region. This study analyzes forest structure in relation to cattle impact in the southern Pantanal of Mato Grosso do Sul, Brazil. The study took place on a ranch in the upper Rio Negro subregion. The understory vegetation was divided into habit categories (i.e., tree seedlings, shrubs, herbaceous vegetation, lianas, and epiphytes) and compared between 2 low and 2 high cattle-impact areas. We sampled in 100 plots of 1 m^2 for each area. 1192 individuals were counted and identified. The total number of species and families was 54 and 28, respectively. Higher diversity and evenness of species occurred in low cattle-impact areas. The densities of tree seedlings and shrubs in low-impact areas were significantly greater ($P < 0.0001$ and $P = 0.001$, respectively) than those of high-impact areas, while the density of herbaceous vegetation was greater in high-impact areas ($P < 0.0001$). The evidence indicates that cattle significantly alter the composition of the understory, and consequently forest biodiversity.

S06.OC.07

Cattle impacts on native mammals and birds visiting fruiting trees in southern Pantanal forests

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Two hundred-plus years of cattle impacts and recent land-use alterations related to ranching operations have negatively altered the flora and fauna of the Pantanal, a Florida-sized alluvial plain that has been a haven for wildlife in South America. We used 2 years of camera-trap surveys to evaluate the impact of cattle operations on ground-dwelling native mammals and birds visiting 10 dominant fruiting-tree species in *cordilheira* (i.e., rarely-flooded formations on non-riverine paleo-levees) forests of the southern Pantanal. Monthly fruit censuses and searches for fruiting trees showed a greater diversity of fruiting-tree species in forested areas with low cattle-impact levels. We recorded 29 native mammals and birds at fruiting-tree sites (86% frugivorous). Cattle operations had a strong impact on animal visits to fruiting-tree sites. Analyses at 3 levels: 1. all 10 fruiting-tree species, 2. all excluding a mast-fruiting species, and 3. only *Attalea phalerata* palms, showed that faunal composition in low cattle-impact areas was significantly different from that in high cattle-impact areas. At low cattle-impact sites, a greater diversity of species was recorded. Long-term alterations of forest vegetation related to cattle operations, as well as short-term fruit depletion or interference by cattle, are probable explanations for faunal differences. Five frugivores and 1 carnivore were significant indicators of low cattle-impact conditions at fruiting-tree sites, while the responses of *Tayassu pecari* and *Crax fasciolata* to cattle impacts varied according to fruit-species nutritive value, timing, and distribution. Novel cattle management will be necessary to reverse biodiversity losses in Pantanal forests.

S06.OC.08

RICHNESS AND ABUNDANCE OF BIRDS AND TERRESTRIAL SMALL MAMMALS IN CAMBARAZAL FORESTS OF DIFFERENT AGES

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The Cambarazal is a *Vochysia divergens* forest that can be considered an invading species when occurring in flooded fields. A relevant question for management and biodiversity conservation includes field cleaning, and the Cambarazal's age can be used as a tool in judgments of invaded areas clear-cutting. The aim of this research was to compare abundance and species richness of birds and terrestrial small mammals in three Cambarazals' forests of different ages (C1< 20; 30 < C2 < 40, and C3 > 40 years). Birds and mammals were captured (mist-net and live-trap), marked (numbered metal band and earring), and released throughout 17 month campaigns. For birds, the highest observed richness was recorded in C2 (n=132), followed by C3 (n=121), and by C1 (n=114). In general, for birds the abundance was consistently lower, throughout seasons, at C1 than at C2 and C3. For mammals, the greatest variation in observed richness throughout seasons was recorded at C1 (from 3 to 6), but all three areas recorded the highest richness in dry season (n=6); C3, the eldest, had the highest observed richness (n=8). Comparing seasons, abundance was lower during the flood, but even so this value for C2 and C3 (n=26 and 24, respectively) is greater than the greatest abundance recorded at C1 (n=23, water-leaving season). Apparently, for birds and mammals, the age of Cambarazals' forests affects the abundance, in the short and medium term, and richness, in the long run, and can be used, as a tool of associated biodiversity, in the management of invaded areas.

S06.OC.09

Drivers of mammalian diversity in the northern Pantanal

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Comprehending the mechanisms that drive spatial variation in biological diversity is at the core of ecological thinking. Classical niche theory postulates that environmental gradient and complexity mediate crucial processes that structure local assemblages, allowing species to persist. The association between spatial and environmental factors and mammalian inventory and/or differentiation diversity in the Neotropics has been usually investigated by coarse grain studies, thus the effect of fine grain environmental factors on mammalian diversity is still largely unacknowledged. In this study, we investigated the effects of environmental, spatial, and spatially structured environmental factors on mammalian α- and β-diversity, focusing at the microhabitat scale. Our data comes from a camera trap survey encompassing 116 sampling units (over 61,800 hours of trapping effort) covering an area of approximately 1,100.42 km^2 in the northern Pantanal. We measured nine independent environmental variables in order to describe the vegetation structure, and used ordination methods and simple linear models to discriminate the independent contribution of these factors. Our results show that environmental and spatial factors, jointly, are more important than the independent effects of each factor for both α- and β-diversity. The complete models accounted for 18% of the variation in α-diversity and 41% of the variation in β-diversity. Environmental factors alone explained nearly 51% of the total explained variation for α-diversity and 61% for β-diversity. Our data suggests that although most large Neotropical mammals are broadly distributed, they do not occur homogeneously across the landscape, and that the role of spatial niche may be critical in order to maintain species richness at the landscape level.

S06.OC.10

Conservation benefits of rotational grazing for Pantanal wetlands

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Efforts to increase the economic viability of ranches in the Pantanal, where 95% of the Brazilian portion is privately-owned, are increasingly focused on environmentally-harmful practices, like deforestation and conversion of native habitats to exotic pasture. These practices, which may provide short-term profits, have long-term environmental consequences including losses of ecosystem services and biodiversity. A recent study in a native pasture region of the southern Pantanal showed that rotational grazing increased cattle productivity in comparison to traditional continuous grazing, demonstrating the potential of rotational grazing as a profitable and eco-friendly practice that reduces incentives for deforestation and habitat conversions. To evaluate environmental impacts of the practice on a southern Pantanal ranch, we compared the aquatic communities of small (<10 ha) rain- and groundwater-fed wetland/lakes (*baias*) exposed to rotational and continuous grazing. Before establishment of the rotational system, wetlands were equally exposed to 20-plus years of continuous grazing within large (>500 ha) enclosures. Results showed dramatic differences in the composition of near-shore emergent plant zones after only 8 months. Wetlands exposed to continuous cattle grazing had areas of exposed sediments from trampling, while emergent plant zones of wetlands in the rotational system were dominated by dense stands of aquatic rushes (Cyperaceae). These results showed that the grazing rest periods of the rotational system were important for recovery of aquatic shore vegetation. Additionally, improved pasture quality in the rotational enclosures during grazing periods may have reduced cattle foraging and impacts in the wetlands, contributing to long-term maintenance of water quality and aquatic biodiversity.

S06.OC.11

Pasture management and maintenance of habitat and species diversity: perspectives for the conservation of the Pantanal

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The Pantanal is one of the largest wetlands in South America. In Brazil, while there is general agreement among politicians, scientists, and all those interested in environmental protection that the region is of high value and should be protected, management of the country's share of the Pantanal is currently the subject of political debate. Specifically, there are major conflicts of interests between stakeholder groups regarding both the goals of management and the tools to be applied. The problem is in part due to the fact that the different proposals under consideration are based on Brazilian environmental laws that target dry upland ecosystems. However, neither the existing laws nor the new proposals are adequate for the Pantanal, since they completely ignore the role of hydrology as the principle driver of ecosystem processes in wetlands.

Long-term experiments and field observations in the northern Pantanal have shown that the exclusion of cattle and/or a lack of pasture clearing leads to the expansion of a few native herbaceous and woody species in the abandoned pastures. Shrubs and a few large tree species build monospecific stands that eliminate the diverse herbaceous stratum, reducing habitat diversity and the diversity of plants and animals. Furthermore, this expansion also has negative economic consequences for the Pantanal's ranchers, who are deprived of pasture area for their cattle, and for tourist enterprises, because of the loss of scenic beauty and a reduction of charismatic animal species, which require open space.

In the Pantanal, human impact has been felt since the arrival of Europeans, who introduced cattle ranching into the Pantanal. Our analysis shows that the actual vegetation cover of large parts of the Pantanal is the result of two and a half centuries of careful management by traditional cattle ranchers. These managed areas are not to be considered as natural; rather they are a highly valuable cultural landscape in which habitat and species diversity and its ecological functions have been maintained. Accordingly, traditional low-density cattle ranching can be viewed as a wetland-friendly management option, as long as the full protection of key habitats is guaranteed by law.

The comprehensive description of the major habitats of the Panatanal, together with a characterization of their roles in maintaining its landscape integrity (Nunes da Cunha & Junk 2011) will facilitate the elaboration of new criteria for management and protection efforts. Moreover, such efforts will contribute to the implementation of a Brazilian Law for the Management of the Pantanal, harmonizing sustainable management and environmental protection.

S06.OC.12

Behavioral responses to simulated predator presence on black howler monkeys (*Allouata caraya*) in southern Pantanal

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Predation events are fast and difficult to report in field. Our objective was to test whether there is change in the behavioral response of howler monkeys in the presence of a color pattern of its natural predator, the *Panthera onca*. Three groups of *Alouatta caraya* were studied in the Pantanal of Miranda. A control observation was made of 15 minutes with the presence of human being and monkeys. After that, a person came covered by a fabric of 2x2m with the design of the jaguar colors pattern, thus simulating the 'walk' of the jaguar. To define the behaviors, it was used the ethogram of Cunha (2004). *Ad libitum* indicated the behaviors report. Early morning, the groups were vocalising the marking territory call, ‘the roar’. With the control observation, the female and her cub of the first group(a female, a cub, a young male and a dominant male) fled, while nothing changed with the second(two males, two females and two cubs) and third groups(two females, a cub and a male). With the entry of 'jaguar', in the first group, the young male stopped singing, without moving and the dominant male fled. The second and third groups changed the *roar* vocalisation to the alarm call. Whereas in the second group, the individuals approached themselves in a center point, with a strong alarm vocalisation, the third group stopped moving after the alarm call of the male. In all groups, the cub approached to the mother. In conclusion, it is clear that the monkeys had behavioral responses to the threat of 'jaguar' different from the ones to human being presence. However, these responses could be related to something never seen before by monkeys, instead of the color pattern of the natural predators of howler monkeys. Further studies are necessary to clarify these doubts.

S06.P.01

Visitors of a Saline Lake in the Pantanal-Nhumirim Reserve Experimental Station

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The Nhecolândia, a sub-region located in the South Pantanal wetland is a lowland ecosystem which has a large number of saline lakes. In the dry season, these lakes are the last to dry since they present a lower topographic position than their surroundings and have groundwater as their source. Given this characteristic which provides great importance to these ecosystems, this study aimed to identify the wildlife visitors associated to a saline lake located in the Nhumirim Reserve Experimental Station (EMBRAPA Pantanal, Corumbá, MS) in dry season. Field observations were made during a morning shift and a night shift from a fixed point alongside the lake. A total of 4 hours of nocturnal and 4 hours of diurnal time were recorded where a one minute scan was performed with 15 minute intervals. The species were identified based on direct observations and identification by guidebooks, and the number of individuals were reported for each observation period. 25 species were indentified who visited the saline lake during the day and four species during the night. Only *Nycticorax nycticorax* (black-crowned night-heron) was observed during the nighttime. Individuals of *Cayman yacare* (yacare cayman) were present in all observations during the night, representing approximately 94% of the relative frequency of observations. During the day, *Amazoneta brasiliensis* (brazilian teal) presented a relative frequency of approximately 27%, followed by *Bubulcus ibis* (cattle egret)and *Jacana jacana* (wattled *jacana*) (22% and16% respectively). A nest with nestlings of *Himantopus melanurus* (black-tailed-stilt) was observed on a small island within the saline lake. Animals considered threatened, like *Tapirus terrestris* (lowland tapir), were also observed using this saline habitat. These results show the importance of preserving these saline lakes in this region of Pantanal. Such sites are used as nest, food and water resources by different groups of animals, in particular aquatic birds.

S06.P.02

Analysis of relatedness of white-lipped peccary (*Tayassu pecari*) herds from the Brazilian Pantanal

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Keywords: Mammals, Tayassuidae, social structure, relatedness, *Tayassu pecari*.
Opportunities for kin selection depend on the spatial proximity between genetic relatives. White-lipped peccaries (*Tayassu pecari*) are frugivorous-omnivorous ungulates that form large herds made up of subherds. However, the genetic relatedness between individuals in the herds and subherds of this species has never been characterized. Subherds are comprised of both sexes and all age classes, and in the Pantanal subherd numbers range from 30 – 80 individuals. Frequently these subherds are broken into smaller foraging groups. Our aim was to estimate relatedness between individuals within white-lipped peccary herds to test the hypothesis that individuals that have a higher degree of spatial proximity (i.e. are more often together) are also more closely related. We captured and genotyped 184 individuals at 15 microsatellite loci from two different herds in the Brazilian Pantanal that are located 70 km apart. We considered that individuals captured together (foraging group) in the same trap on the same day (referred to as a sampling group) had a higher degree of spatial proximity. We estimated the genetic relatedness between individuals in each herd using a maximum likelihood estimator. We compared the median of relatedness indices in two different ways: between sampling groups, and between sampling groups excluding young (in order to exclude possible bias related to the sampling of dependent young). Genetic relatedness between individuals from the same sampling group was significantly higher than that between individuals from different sampling groups, even when young were excluded. The results found here suggest that the relatedness between individuals have some importance in the spatial social structure of white-lipped peccaries.

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S06.P.03

Structure of two monodominant communities and association with soil and flooding in the Pantanal, Brazil.

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The Pantanal is a set of great depressed plains, located in the Upper Paraguay River Basin, where the four most important phytogeographic provinces of the continent converge: Amazon Forest, Brazialian Savanna, Chaco and Atlantic Forest. The fluvial morphological particularities of the several rivers in this region influence differently the characteristics of soils and vegetation. Among the various vegetation types existing in the Pantanal, the monodominant formations stand out for covering large areas, specially for the *Tabebuia aurea* (paratudo) and *Byrsonima cydoniifolia* (canjiqueira) dominance. This study was developed in a community located in the region of Miranda and another in the region of Nabileque. The aim of this study was to determine if the soil type and level of flooding influence the occurrence and abundance of tree species in these communities. The vegetation was assessed in plots totaling 3ha for each community, individuals with circumference ≥10cm to 90cm of soil were included, and we collected soil samples and measured the level of flooding. Data were tested by Canonical Correspondence Analysis (CCA), where abundance of species per plot, soil fertility and particle size and level of flooding were included. Each community had 6 species, but in Miranda, community was dominated by *B. cydoniifolia* and Nabileque was dominated by *T. aurea*. The results indicated the relative abundance of paratudo with higher levels of flooding and clayey soils with a higher concentration of organic matter, calcium and magnesium. The canjiqueira occurred in sandier soils with lower fertility, the occurrence of this species in the Pantanal seems to be related to areas of low water forming sand ridges, which have a lower deposition of organic matter.

S06.P.04

Dynamics of Cambarazal - a monodominant flooded forest of *Vochysia divergens* Pohl (Vochysiaceae) - in North Pantanal, Mato Grosso State, Brazil

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We investigated the tree community dynamics along a hydro-topographic gradient in a cambarazal, North Pantanal, Mato Grosso, Brazil to answer the following questions: 1) Is the cambarazal edge more dynamic than its interior? 2) Is *Vochysia divergens* population invading adjacent field areas to the cambarazal? Two successive surveys of trees (dbh ≥ 5 cm) were carried out in 2005 and 2009 in four permanent plots of 1 ha distributed along the flooding gradient. There was an increase of 2891 individuals and growth of 4.92 m² of basal area. Species richness also increased in the four plots. Were recruited 3538 individuals belonging to 88 species. Only three species (*Eugenia egensis, Peritassa dulcis* and *Vochysia divergens*) accounted for 49% of individuals recruited. Mortality rates in Plots I, II, III and IV were 4.0%, 5.4%, 3.0% and 4.6%, respectively. Our data indicate that the community is growing and one of the most dynamic forests reported in the literature. The dynamics rates of cambarazal edge did not differ to the interior community rejecting the first hypothesis that would be more dynamics. However, the changes were strongly dependent on *V divergens* that recruited mainly in less flooded plots suggesting a shift toward less inundated adjacent field areas. Moreover, senescent individuals of *Vochysia divergens* in areas of greatest flood, are being replaced by species that initially had few individuals *as E. egensis* and *P. dulcis*. Our data suggest that, over the years, the population of *V. divergens* be installed in locations adjacent to the current portion and other species will tend to increase numerically changing the ratio of dominance observed today

S06.P.05

General aspects of breeding biology in Vespertilionidae species (Chiroptera; Mammalia)

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The Verspertilionidae, that is included about 35 genus, 318 world species, 75 american species and 19 have been already reported in Brazil. Bats can be able to adapt their reproductive pattern according to environmental adversities. The objective of this study was to interpret the adjustment capacity of the reproduction process of some Verspertilionidae in environmental conditions. It was analyzed morphological and morphometrical characteristic of 625 individuals of ten species from different Brazilian biomes. The females of *Epitesicus furinalis* present two pairs of mammas and the males present very developed testicles and epididimus, without pigmentation of the tunica albuginea. This specie preferentially used internal naturals or artificials refuges, and they reproduce from the beginning of winter until the end of summer, generating two babies. Almost 65% of pregnant females of *Histiotus velatus* developed twins. However it wasn't registered two lactents (only one of them). Usually species of *Lasirius* used natural or artificial external refuges. Environmental luminosity factors can induce mechanisms of embrionary lantency. Generally there are two babies per birth, however in *L. blossevillii* five babies were observed with a lactant, witch has two pairs of mammas. The male gonads are covered by a pigmented tunica albuginea in *Lasiurus*. The roosts used by species of *Myotis* are classified as internal (natural or artificial). In *M. albescens* as well as *M. nigricans* the choose of refuges are more related to the localisation and size than to the nature of the refuge. It was observed that species of this genus present a continuous reproduction pattern in almost all seasons. A short interruption in the period of reproduction activities occurs in autumn. In response to the environment antropization, the number of individuals will rise, and the population will be reconstituted due to reproductive strategies, as observed in *M. nigricans* (female young reproductive activity).

Key words: Morphology; Reproductive pattern; Roosts; Conservation.

S06.P.06

PHENOLOGY AND DIVERSITY OF AMPHIBIANS IN A REGION OF THE SOUTHERN PANTANAL, BRAZIL

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Amphibians and reptiles present plasticity in relation to biotic and non biotic environmental variation at local and regional scales. Amphibians, specially, present a variety of reproductive strategies which are adjusted to their needs and biological attributes such as reproduction season and the selection of aquatic environments suitable to the development of their larvae. This study aims to explore the diversity and phenology of anurans in an area of the southern Pantanal wetland (Nhumirim and Alegria ranches, Nhecolândia region, Corumbá, Mato Grosso do Sul). The diversity was assessed through surveys conducted from 2004 to 2011, while abundance was assessed from February 2005 to May 2006. This information was compared with rain precipitation during the days before the captures. The most representative Families regarding abundance were Leptodactylidae and Microhylidae, which together contributed with more than 94% of the 20,000 individuals captured in pitfalls. Species with continuous, long-lasting reproduction strategy, mostly terrestrial and cryptozoic amphibians, presented extended reproduction period at Nhumirim ranch when compared with other areas of the southern Pantanal, such as the neighbor Abobral region. At Nhumirim, *Physalaemus albonotatus* and *Pleurodema* cf. *fuscomaculata* presented presenting extended, explosive reproduction strategy, with tendency to continuous reproduction. Most species had recruitment in almost the entire years of 2005 and 2006, being absent in the peak of the dry season (July to September). The same pattern was observed in other years, even when sporadic surveys were conducted. Additional studies including natural history are necessary, at local and regional scales, to support conservation of the wetland.

S06.P.07

Interspecific relations between hematophagous bats *Diaemus youngi*, (*Anodorhynchus hyacinthinus*) and *Ramphastos toco* in macaw nest cavity sites

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The hematophagous bats represent less than 0.5% of Chiroptera and their distribution is restricted to Latin America. Considering the diversity of bats registered in the Pantanal of Miranda, about 10% of its trophic structure represents hematophagous bats. Registration of hematophagous bats in the Pantanal has indicated that their occurrence is scarce and rare. For over twenty years the Hyacinth Macaw Project has been systematically monitoring natural and artificial nest cavities used by Hyacinth macaws (*Anodorhynchus hyacinthinus*) yearly by using direct observations, photography, and microcamera installed inside the nest. We were able to record both species using Hyacinth macaw nest cavities, and observe foraging activity by *Diaemus youngi* in active nests that includes important interactions between *D. youngi*, *Ramphastos toco* and *A. hyacinthinus*. Microcameras, recorded foraging activity of *D. youngi* on chicks of *R. toco* for an estimated period of four hours. In this case, *D. youngi* did not kill the chicks. However, in another cavity, *D. youngi* was observed a supposed foraging on a Hyacinth macaw chick, and the chick showed significant bleeding. The next day there was no sign of bleeding and the chick was alive. However after 30 days, the chick's skeleton was found in the nest. The occupation and interaction of other species in the use of Hyacinth macaw nest cavities have been common, but these were the first records of *D. youngi* using native wildlife as a food source. Further studies of their impact on native wildlife health is necessary.

Key words: Ecology; Nest; Conservation; Pantanal

S06.P.08

Fish Species Richness in Marginal lakes of Miranda River, MS,Pantanal

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The Pantanal is the largest continuous wetland of South America with approximately 140.000 km². During the drought period, marginal lakes along the river are formed, creating temporary or permanent environments, which link back to the river during flood pulses. Fish communities are affected by this cycle, since during periods of flooding, eggs, larvae and adults can suffer spatial reorganization amongst these bodies of water. This study aimed to verify if differences exist between the fish communities in marginal lakes and that of the Miranda River during a period of drought. We tossed 15 fish nets in two areas along the Miranda River and two areas located in two marginal lakes for sampling of the ictiofauna. Areas with distinct aquatic vegetation were prioritized in order to obtain a more representative sampling of species in each environment. A total of 695 individuals belonging to 9 families and 26 species were sampled. Four species were unique to the Miranda River and 13 species were unique to the marginal lakes. When performing a cluster analysis two sets of species were observed, although species composition showed no significant difference between environments ($Q = 1.92$, $p = 0.06$), however we consider this a significant result due to the small sample size. Our results demonstrate the importance of preserving the marginal lakes along the river despite them being homogeneous during flood pulses, they present a distinct fish composition, possibly due their lentic properties.

S06.P.09

Nucleation process promoted by mistletoe in the Brazilian Pantanal and Caatinga

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The relationship between mistletoe and its host plant is usually approached with the focus on suffered damages by the host. On the other hand, parasitic plants may be involved in other ecological processes, normally they have fruits that attract birds, and while they feed, seeds of other species may be deposited. This process, called nucleation process, was already described for trees whose fruits attract birds, and by this way, other plants stay clustered under their crown. To examine if parasitic plants can promote nucleation process we used as models two host trees infested by the hemiparasitic mistletoe *Psittacanthus cordatus* (Hoffmanns.) G.Don. (Loranthaceae). The first host plant is *Triplaris americana* L. (Polygonaceae), an anemochorous tree species common in riparian areas of Pantanal Miranda Abobral/MS. The second host plant is *Commiphora leptophloeos* Mart.) J.B.Gillett (Burseraceae), which is a zoochoric tree species frequent in areas of Caatinga at Pernambuco state. We compared the abundance of individuals, species richness and diversity of plant communities under the crown of *T. americana* (n= 30) and *C. leptophloeos* (n= 20), with and without the mistletoe. In addition, for the model *C. leptophloeos*, we analyzed if the frequency of zoochoric individuals and species was larger under influence of parasitic plant. We recorded 3074 individuals and 47 species for the model *T. americana*; and 1096 individuals belong to 30 species for the model *C. leptophloeos*. In both models the abundance of individuals, species richness and diversity was larger when under the influence of parasitic plant. The frequency of zoochoric individuals and species was higher when under the influence of infestation. Our results gather evidences that mistletoes can promote nucleation process and intensify this process when they occur in zoochoric hosts, revealing the important role of parasitic plants in structuring plant communities.

S06.P.10

Experimental evaluation of *Attalea phalerata* seed predation along a gradient of palm density in the Brazilian Pantanal.

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The Janzen-Connell model predicts that density- and distance-dependent seed mortality caused by species-specific predators reduces conspecific recruitment near the parent trees. However, dispersal limitation explains species aggregations at the scale of several hundred meters that are observed in tropical forests. In the Brazilian Pantanal, the palm *Attalea phalerata* (acuri) occurs in semi-deciduous heterospecific forests, and may also occur in high density monodominant aggregations (acurizais). We studied the acuri seed predation with experimental wire-caged seed excluders in four landscape categories with different palm densities (ECA-6.16 ind/m2; EAD-3.72 ind/m2; EAM-2.45 ind/m2; ECS-0.08 ind/m2) in the RPPN SESC Pantanal. Five replicates of each lansdcape category were sampled, where four treatments were set (ten fruits on each): negative control (excludes invertebrates and vertebrates; T1), only invertebrates (T2), invertebrates and small vertebrates (T3), and the positive control (no exclusion; T4). Acuri densities were estimated in 20 x 20 m plot in each site. Seeds were gathered after 11 months and classified as preyed by bruchines, unviable or viable. Considering only the fruits available in T3 and T4 (400), 115 were taken from the experiments by vertebrates, but there was no differences between landscape categories ($F=2.56$, $p=0.09$) or treatments ($t=37$, $p=0.21$). From the remaining fruits, in average 47% of the seeds were preyed by bruchines and these proportions did not differed among landscape categories ($F=1.94$, $p=0.13$). The proportions of unviable ($F=2.05$, $p=0.15$) and viable ($F=1.2$, $p=0.34$) seeds did not differed among categories also. The acuri densities were not related with the proportions of seeds preyed by bruchines ($R^2=0.002$, $p=0.84$), unviable ($R^2=0.1$, $p=0.18$) and viable ($R^2=0.01$, $p=0.62$). These results suggest that the bruchine beetles are homogeneously distributed in the landscape and that its predation pressure is not related to the palm density of the acurizais. The bruchine predation recorded in areas without acuri further strengthens this hypothesis.

S06.P.11

Pantanal flooding pulse affects metazoan parasite assemblages of two host fishes

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Parasite transmission success is generally modulated by several environmental factors. Understanding how host-parasite relation respond to environmental change might allow us to anticipate the effects of climate and other global changes on parasites and their hosts. The marked seasonality and annual flooding pulses determine most ecological processes in the Pantanal. Fishes are directly affected by the flood pulses and and their outcomes. In this study we address how metazoan fish parasites respond to flooding trough comparisons of parasite communities before and after flooding in two host species. We collected, respectively, 30 and 30 fish specimens of Cyphocharax gillii and Psectrogaster curviventris before the flooding and, respectively, 44 and 34 after the flooding, in a lake next to the Miranda River. Mean parasite species richness and abundance were recorded, and the Brillouin diversity index was calculated. Differences in these descriptors were then tested with the Mann-Whitney U test. Mean parasite species richness, abundance and diversity of C. gillii were higher before (2,22±0,81; 63,53±39,17 and 0,19±0,12) than after the flooding (1,61±1,30; 26,67±20,30 and 0,12±0,13). Differently, P. curviventris mean parasite species richness, abundance and diversity were lower before (3,27±0,87; 89,14±62,66 and 0,20±0,08) than after the flooding (3,79±0,98; 113,97±79,48 and 0,29±0,07). Despite having contrasting patterns, both fishes responded with differences in species richness (C. gillii Zc=5,47; P. curviventris Zc= 1,8642 $p< 0.05$) abundance (C. gillii Zc= 3.90; P. curviventris Zc= 2,0455 $p< 0.05$) and diversity (C. gillii Zc=5,34; P. curviventris Zc= 4.2523 $p< 0.05$) in their parasite communities. Despite having their host as primary habitats, most parasites are exposed to a multitude of environmental factors. Infection levels may increase or decrease following changes in these conditions by altering the survival or infectivity of the infective stages. Additionally, the lake and the Miranda River are connected during the flooding, which might enhance species turnover.

S06.P.12

Visibility and rate predation of artificial nests in Southern Pantanal

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The nests accessibility and the community structure of predators are factors that determine the proportion of nest predation of birds. My objective was to determine the rate of predation in two treatments of visibility and to identify predators of artificial nests for each treatment. The less visible treatment was the nest covered by leaves of *Scheelea phalerata* or by the plant *Andropogon bicornis L.*. and the more visible one was the nest without these leaves. Each nest had only one egg of Japanese Quail (*Coturnix coturnix)*. In seven forest patches, I tested the predation of 90 artificial nests. I monitored the nests with cameras trap to photograph potential predators for the two treatments of visibility. The more visible nests were three times more depredated than less visible ones (G= 13.65; gl=1; p=0,0002), where most of the nests were with pecked eggs. Among the forest patches, the predation rate differed between the two treatments (t=4; gl=12; p=0,0009), while the birds *Cyanocorax chrysops* and *Aramides cajanea* were identified as predators of the more visible nests. The mammals: crab-eating fox (*Cerdocyon thous*), coati *(Nasua nasua)* and long-nosed armadillo (*Dasypus novencinctus)* were at less than one meter from the visible nests and they did not depredate them. As well as two opossum *Didelphis albiventris* and a coati, for the less visible nests. In conclusion, by data from camera trap and evidences of pecked eggs, birds are indicated as potencial predators for the more visible nests, once mammals depredate only the whole egg. Further studies are necessary to describe the predators community of nests in this site for a better understanding of the reproductive success of birds.

S06.P.13

METAZOAN ENDOPARASITE COMMUNITIES OF *Leptodactylus chaquensis* AND *L. fuscus* (ANURA: LEPTODACTYLIDAE) IN PANTANAL, MATO GROSSO DO SUL, BRAZIL.

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Specimens of *Leptodactylus chaquensis* and *L. fuscus* were collected from november/2009 to april/2010 in the Miranda-Abobral region, Pantanal of Mato Grosso do Sul State, aiming the study of their metazoan endoparasite communities. In the parasitological examination of *L. chaquensis* were registered 23 *taxa* in 94.33% of the individuals examinated, whereas 97.78% of the *L. fuscus* was infected with a total of 13 parasite *taxa*. In all, 25 parasite *taxa* were registered, with 11 occurring in both anuran species (*Brevimulticaecum* sp., *Cosmocerca parva*, *Cosmocerca podicipinus*, Cosmocercidae gen. sp., *Oswaldocruzia* sp., *Oswaldocruzia lopesi*, *Physalopteroides venancioi*, *Catadiscus* sp., *Catadiscus marinholutzi*, a Pentastomida larvae and an unidentified cystacanth); 12 was found exclusively in *L. chaquensis* (Acuariidae gen. sp., *Aplectana* sp., *Falcaustra mascula*, *Oswaldocruzia proencai*, *Physocephalus* sp., *Rhabdias* sp., *Catadiscus propinquus*, *Glypthelmins* sp., *Glypthelmins palmipedis*, *Glypthelmis repandum*, Molineidae gen. sp. and Nematoda gen. sp.); and two found only in *L. fuscus* (Physalopteridae gen. sp. and *Schrankiana formosula*). The infrapopulation and infracommunity descriptors were calculated and the similarity between them was statistically tested. The metazoan endoparasites communities of both host species were characterized by the absence of central species and by the predominance of helminths with direct life cycles. Among the *taxa* that occurred in common to both hosts, the prevalence of *Brevimulticaecum* sp., Cosmocercidae gen. sp., *Oswaldocruzia* sp., *Oswaldocruzia lopesi* and *Catadiscus* sp.; and the abundance of *Brevimulticaecum* sp., Cosmocercidae gen. sp., *Oswaldocruzia* sp. and *Catadiscus* sp. were higher in *L. chaquensis*. The values of diversity, uniformity and parasite richness were significantly higher in the *L. chaquensis*. Also, the infracommunities were considered distinct, suggesting that morphological and comportamental differences between the hosts, such as higher body size in *L. chaquensis*, could be determinants in the effect of structuring the endoparasites metazoan communities.

S06.P.14

How well adapted are cleaning birds to cattle in the Pantanal, Brazil?

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The introduction of exotic animals is currently one of the biggest environmental problems faced by man. Domestic cattle was introduced in the Pantanal almost three centuries ago and it is still not well known how native animals have adapted themselves to the presence of these invaders. The direct interaction between birds and mammals is very common in the Pantanal, with at least 13 species of cleaning birds removing ectoparasites from mammals or using them to flush prey off of vegetation. The aim of this study was to determine whether the cleaning birds are interacting with livestock, as well as the type of interaction occurring and the response of the mammals to the presence of these birds. The behavior of the birds and the cattle was recorded between November 2011 and February 2012 for 5 hours a day, totaling 30 hours of observation. A low number of interactions were recorded (n=35) with only seven bird species interacting with cattle. *Molothrus oryzivorus* (n=13*)* and *Caracara plancus* (n=10) were the most frequent, followed by *Coragyps atratus* (n=4), *Guira guira* (n=3), *Machetornis rixosa* (n=3), *Furnarius rufus* (n=1) and *Molothrus bonariensis* (n=1). The cattle showed indifference to the presence of almost all birds (88.6%), rejecting the approach of only 30% of *C. plancus* and 7.7% of *M. oryzivorus*. Only 23.6% of the birds removed ectoparasites from the cattle, the remainder (76.4%) used the cattle to find prey in a typical commensalist interaction. The cattle seems well adapted to the presence of the birds. But, the low number of birds recorded interacting with cattle along with the dominance of commensal behavior, even among birds well known as cleaners, shows that after almost 300 years the birds still haven't adapted very well to the presence of this exotic species in the Pantanal.

S06.P.15

Evaluation of niche and neutral effects on anuran communities in the southern Pantanal, Brazil

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The niche theory assumes that species require certain environmental conditions to establish, thus community patterns are expected to be influenced by environmental factors. On the other hand, neutral theory assumes that stochastic factors are shaping the communities, and that niche is irrelevant. Here we evaluate whether niche or neutral theory better explain patterns of anuran communities in the Pantanal, sub region of Nhecolândia. Under niche theory we expected influence of environmental factors on species richness and composition, and under neutral theory we expected influence of distances between sampling units (SU) on species composition. Anurans were sampled with pitfalls during the wet season on 23 SU at least 1 km apart. Dissimilarities among anuran communities were assessed through Bray-Curtis index, and the greater pattern was represented by non-metric multidimensional scaling (NMDS). Environmental gradients were extracted through principal component analysis (PCA). To evaluate the effect of niche we used two multiple regression: species richness X PCA axis and NMDS X PCA axis. To evaluate the effect of neutrality we used Mantel test between Bray-Curtis and SU distances matrix. We captured 882 individuals of 14 species. *Physalaemus albonotatus* was the most abundant species and occurred in all SU, followed by *Pleurodema fuscomaculata*. The richness ranged from 2 to 8 (mean=5 ± 2). Axis 1 of PCA represented the gradient of vegetation stratification and explained the anuran richness ($r^2 = 0.41$, $p = 0.001$) and species composition ($r^2 = 0.32$, $p = 0.004$). The similarity between sites was not correlated to geographic distances. Therefore the effect of environmental gradient supports that niche theory best explains patterns of anuran communities in the Pantanal. Studies in different regions and scales have also found greater influence of environmental than spatial factors on anuran communities, which is attributed mainly to the physiological and reproductive limitations of this group.

S06.P.16

Effect of sampling quality on patterns in community structure: a case of lizards in the Pantanal, Brazil

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Evaluating the quality of sampling is essential to ensure reliable interpretation of patterns in communities, often used for decision making in conservation plans. However few studies address this issue. Our objective here is evaluating the effect of sampling quality in the pattern found in the lizard community structure regarding the environment. We sampled the lizards in the Pantanal, Nhecolândia region, Brazil, monthly between December 2011 and March 2012, five nights per month, with pitfall traps in 23 sites at least 1 km apart. We measured seven environmental traits per site. Dissimilarities among sites regarding lizards communities and environmental traits were assessed through Bray-Curtis index. To evaluate the effect of environment on community we used Mantel test between matrix of species and environment. To evaluate the effect on samplings, this test was made in four categories of sampling effort. We found 323 individuals, with predominance of two species, *Cnemidophorus ocellifer* (56%) and *Vanzosaura rubricauda* (26%). The overall richness was 13 species. Richness per site ranged from 1 to 4 (1,9±0,8) in the first sampling category, 1 to 4 (2,3±1) on the second, 1 to 5 (3±1,1) on the third and from 1 to 5 (3,3+1,2) on the fourth. With one and two samplings the correlation between environmental and community structure was weak ($r = 0,17$; $p = 0,04$ and $r = 0,17$; $p = 0,05$ respectively), but it greatly increased in the third ($r = 0,33$; $p =0,0007$) and fourth categories ($r = 0,39$; $p = 0,000009$). Our results reinforce the importance of evaluating the quality of sampling before interpreting patterns in communities, and that we can find wrong results if the species composition is not well represented.

S06.P.17

Community structure of tadpoles in the Pantanal, Nhecolândia region

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Tadpoles play a variety of ecological roles and are found in a wide variety of microhabitats. Among the major factors governing community of tadpoles are environmental heterogeneity and hidroperiod. We studied the contribution of ecological factors on the tadpole communities in the Pantanal, Nhecolândia region. We selected 23 ponds with different vegetation structure and swept all around using a dip net to collect tadpoles. The second order Jackknife extrapolated richness was 23 species, whereas the observed richness was 15. The collector curve was instable likely due to many individual are not at the identification stage, being disregarded. Beyond this, the number of species which were vocalizing, then in reproductive period, was low. By the standardized Levins index, none species was considered generalist. Not always the most abundant species are generalists, they can only have a higher reproductive rate differential or are specialists in some pond characteristics. Therefore, species as *Leptodactylus chaquensis* (1099 individuals), for example, were considered specialists. We used Correspondence Analysis to evaluate the influence of environmental traits on the presence of species. Ponds depth and surface area, and occurrence of floating, submersed and marginal vegetations up to 30cm were the main descriptors of community organization. The choice of habitat had a strong influence in the developmental and growth strategies used by tadpoles. Bigger ponds offer higher microhabitat variety for both adults and tadpoles. The presence of pond vegetation contributes to the allochthonous material entrance, which is considered an important energetic source for tadpoles. In addition, vegetation also protect tadpoles against solar radiations, another factor that affects tadpoles communities.

S06.P.18

Do foreign mammals contribute to maintain populations of the tick *Amblyomma cajennense* in the Brazilian Pantanal?

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Bos indicus and *Sus scrofa* are the most abundant foreign species in the Brazilian Pantanal. *Amblyomma cajennense*, an aggressive tick and vector of pathogens, is frequently found in this region. Although there are sporadic records of *A. cajennense* on livestock and feral hogs, it is uncertain if these mammals contribute to maintain this tick in the Pantanal. To evaluate the role of *Bos indicus* and *Sus scrofa* as hosts for this tick species, infestations of these hosts, small mammals and vegetation were assessed in Nhecolândia (Mato Grosso do Sul State, Brazil), between 2009 and 2011 during dry season (peak of immature stages). The prevalence (P), first and third quartiles (1Q-3Q) and median (M) of immature ticks with evidence of feeding were parameters used for analysis. Infestation by *A. cajennense* (n=170; P=78.3%; 1Q-3Q=1.0-5.7; M=2.0) and *Rhipicephalus microplus* (n=212; P=80.4%; 1Q-3Q=1.0-6.0; M=2.0) on *B. indicus* (n=46) was similar. *S. scrofa* (n=156) was infested by five species, but only *A. cajennense* (n=1006; P=68.6; 1Q-3Q=0.0-6.0; M=2.0) was noteworthy. Small mammals were not significantly infested by *A. cajennense* (n=15) and not a single tick of this species was attached or engorged. Instead, small mammals had high infestation levels by *A. parvum* (n=1588; P=77.4%; 1Q-3Q=2.0-32.0; M=13.0). The environment was highly infested with *A. cajennense*. These patterns of tick infestation associated to the great biomass and spread of *S. scrofa* and *B. indicus* in the Pantanal suggest these host species are suitable to feeding of immature stages and contribute to maintain populations of *A. cajennense* in this region.

S06.P.19

Fitness and reproductive system of two *Dyckia* species from ironstone outcrops, Pantanal, Brazil

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The ironstone outcrops may be considered a peculiar feature of Corumbá and Ladário cities, which are located in the Pantanal wetlands of the state of Mato Grosso do Sul (MS), Brazil. The bromeliads from *Dyckia* genus are characterized by growing as monocotyledonous mats, or with few other species. They have stiff and thorny leaves, been commonly encountered on rocky and sunny areas. In this study, the bromeliads *Dyckia* sp. nov. and *D. leptostachya* will be investigated considering its fitness and reproductive biology. The studied populations are located near the Plateau Residual of Urucum, Corumbá (MS). Up to now, only two wild populations of *Dyckia* sp. nov. were identified. The restricted distribution of this new species is remarkably important, once it appears to be rare and endemic from ironstone outcrops. In contrast, *D. leptostachya* were observed in six natural populations, also occurring in the ironstone outcrops. The number of flowers, fruits and seeds per fruit were recorded, and pollen viability was analyzed in order to verify species fitness. Hand-pollination experiments were performed to identify the reproductive system of each species. We observed high flower, fruit and seed production for both species, concerning one population of each species. Species also showed a moderate proportion of pollen viability, 78.9% for *Dyckia* sp. nov., and 82.6% for *D. leptostachya*. Our data showed that both species are self-compatible (autogamous), and do not dependent on pollinators for fruit set (spontaneous selfing). Wild populations of these two bromeliad species have been reduced by anthropogenic disturbance such as farm activities, which are very common in this region. Moreover, the results achieved together with studies concerning population demography and genetic structure will help to better understand the directions of evolution and conservation of these species.

S06.P.20

Flower number and bird florivory in *Inga vera* (Fabaceae) trees in the Pantanal

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Flowers of zoophilous plants must attract pollinators, but also avoid florivorous. The number of flowers open per plant individual has been reported as one component of floral attraction, but it has been less studied regarding flower consumers. Here I asked how the number of flowers open per tree of *Inga vera* (Fabaceae) can affect rates of florivory by birds in the Pantanal, Miranda region, Brazil. I expected that rate of florivory increases with the increasing of flower numbers up to a certain value, when flower number surpasses the overall demand for flowers by the predators. I randomly selected 26 flowering trees with variable canopy sizes for counting number of open flowers and to sample rate of florivory, assessed through number of damaged flowers deposited on a 4.5 m^2 plots under each canopy in 24 h. I log10 - transformed the data to homogenize variances and linearize relationships between variables. I performed the analyses with linear regression. The number of open flowers per tree positively affected the rate of florivory (r^2 = 0,55 p = 0,0000129). The number of open flowers per tree varied from 110 to 2720 (1159 +/- 829.87) and the number of predated flowers per tree from 0 to 466 (41,23 +/- 98.87). The relationship between flower predation and numbers of flowers in *Inga vera* can be interpreted as harmful to the reproductive success of the specie, due to the loss of reproductive structure. However, the florivorous satiation hipothesis contradicts this idea. This could occurs by the selection of a number of flowers so high for production that exceeds the amount consumed by florivorous until their satiation, so that there remains flowers to form fruits. The more flowers offered in *Inga vera*, the more the rate of florivory by birds on them.

S06.P.21

Use of artificial nests by Hyacinth macaws (*Anodorhynchus hyacinthinus*) in the Pantanal: fourteen years of management for conservation

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Individual wild adults of Hyacinth macaws (*Anodorhynchus hyacinthinus*) are one meter in length and weigh between 1.3 and 1.5 kg. This body size requires availability of large tree cavities for reproduction. Results obtained at the beginning of the research showed that tree cavity scarcity is a limiting factor for Hyacinth macaw reproduction. The objective of this work was to analyze long term data from 1997 to 2011 on the use of artificial nest cavities by Hyacinth macaws in the Miranda subregion of the southern Pantanal. We installed 60 artificial nest boxes the first year; this was also the same number of natural tree cavity nests documented and monitored in the region. Over the years, some nest boxes were lost or removed due to tree falls, insect occupation (especially bees), or were destroyed by the birds. Occasionally the boxes occupied by Hyacinth macaws were recuperated or substituted, and more than 17 were installed. First results indicate that 51% of the artificial nests were explored by Hyacinth macaws, but only 5% were actually successfully used. However, over the years the use of artificial nests has been increasing. Currently, even though egg laying is more successful in natural tree cavities, the survival of chicks is greater in artificial nests. In 2011, 56% of the Hyacinth macaw fledgings successfully flew out of the artificial nests. These results can be replicated to other regions or for other species. However, it is important to emphasize that the availability of natural tree cavities and the reproductive success of Hyacinth macaws, is also affected by egg and chick predation, the availability of food resources, and inter and intraspecific competition.

S06.P.22

Nesting behavior of the Neotropical coati (Carnivora: Nasua nasua) in southern Pantanal.

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Nasua nasua has a complex social structure with adult females and immature individuals forming groups, while males are usually solitary. After the breeding season (early August), pregnant females leave their groups and give birth to up to five youngs in arboreal nests. We then attempted to assess these nesting patterns in southern Pantanal. We installed a radio transmitter on a pregnant coati in October 2011 and found her arboreal nest. We placed camera traps to monitor the nest, which was built in a forest patch, 7.9m beyond the edge. The tree where the nest was built was an abundant legume (*Hymenaea stigonocarpa*) with 10m height, 131cm of perimeter at breast height and 2.3m of first fork height. The nest was 9m above ground and the dimensions were 70x60x25cm (length-width-height). We registered the offspring 13 days after the capture and the female remained in the nest for 28 days. The female restricted her movements within an area of 30m² around the nest. We found no pattern concerning her activity along the day. We also observed a male scent-marking the tree 14 days after the birth. In December the female left the nest carrying the offspring in the mouth and the male mentioned came along. Three days after, we registered a group composed by five adult females, including the sampled one, and their offspring. We observed the group resting in different nests throughout the nights, and the male was no longer registered. Given that is poorly studied, these results are new information apart from the one already available for *N. narica*, in Central America. The presence of a male after birth is an unpublished pattern for the species. Therefore, considering these changes in behavior, the breeding season seems to be an intrinsic stage for the species, although quantitative data are still lack.

S07.OC.01

Tank bromeliads: under-studied freshwater micro-ecosystems in tropical rain forests

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Despite their relevant ecological and functional role in ecosystems, tank-bromeliads are relatively under-studied. In tropical rainforests, a substantial fraction of the freshwater available is impounded within their rosettes that form freshwater islands in a terrestrial matrix. By collecting rainwater and detritus such as leaf litter, these rosettes provide a source of nutrients for the aquatic food web (i.e. the 'brown food web') as well as for the plant itself. Thus, tank-bromeliads play a significant role in sustaining both aquatic and terrestrial biodiversity ranging from prokaryotes to invertebrates.
A survey of different tank-bromeliad species from French Guiana revealed that these miniature freshwater ecosystems have a high specific and functional diversity and, because they provide a habitat for bromeliad specialists, a true conservation value. We show that the composition and structure of the brown food web are affected directly and indirectly by both biotic and abiotic factors. In addition, we recently found the occurrence of algae that might constitute an important source of organic carbon for the aquatic invertebrates inside the tank (i.e. the 'green food web'). We also demonstrate that these phototrophic microorganisms, which are able to absorb inorganic nitrogen, compete with the bromeliads for these nutrients.
Freshwater systems, particularly small bodies of water like those contained in tank-bromeliads, are expected to be highly impacted by habitat fragmentation and climatic changes. It has, however, proven challenging to study the impact of climate change on ecosystems because, among other things, it is difficult to manipulate entire ecosystems. Indeed, the manipulation of small, spatially-discrete food webs such as the ones found in tank-bromeliads might prove highly relevant for future research on the responses of ecosystems to climate change.

S07.OC.02

Morpho- hydrodynamic conditions control the invertebrate benthic fauna along meander bends in a large tropical river (Paraguay River). Implications for habitat assessments and river rehabilitation design.

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The Paraguay River is a meandering large river (mean discharge= 4000 m^3 s^{-1}). Changes in morpho- and hydrodynamic conditions influence benthic invertebrates. However, there are few studies linking morphological features and hydraulic conditions, closely related to sedimentological characteristics, and ecology of invertebrates along meanders.
We selected two meander bends of the Paraguay River. One of them is located downstream of the Bermejo River outlet, a tributary which supplies a huge amount of fine sediments (mainly in suspension) to the Paraguay. The other bend is located upstream of this tributary and the sediment load is significantly lower and coarser.
The results reveal that at meander scale, average bed hydraulic conditions are most intense in the downstream meander and the concentration of suspended sediments is higher (125 mg l^{-1}), leading to low mean density of invertebrates (960 ind. m^{-2}). Moreover, the upstream meander presents lower average values of hydraulic stresses and suspended sediments (56.5 mg l^{-1}), prompting larger benthic densities (15600 ind. m^{-2}). Besides of the bed hydraulic conditions, the suspended fine sediments would have strong ecological implications. A fraction of these particles cover the interstitial spaces between sand bed grains, i.e. the sites where the invertebrates live, preventing their development. At a minor scale, the organisms density decrease significantly on the scour hole (with stronger bed stresses) of the upstream meander. Nevertheless, this relation was not clear on the downstream meander. It could be generated by the high sediment inputs from the Bermejo River, which would reduce the importance of the hydrodynamic role on the invertebrate distribution there. Due to hydraulics and channel morphology (plus sediment input) are key determinants of habitat potential, the combination of them might determine the fauna present in a biotope. Consequently, this fact has potential implications for physical habitat assessments and river rehabilitation design.

S07.OC.03

Importance of Artificial Wetlands and Lakes as Habitats for Birds

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Wetlands have been considered as the most productive ecosystem due to high biological diversity and productivity and are attractive to many species of wildlife mainly birds. This study examined the importance of man-made wetlands as habitats for wildlife species particularly birds. The study was conducted in Putrajaya wetland and lake areas from July to November 2010 using distance sampling point count method. The main objectives were to determine which species of birds used the areas and which important factors that may influence their distribution. A total of 35272 bird observations belong to 98 species and 38 families were recorded at five wetland sites namely Upper West, Upper North, Upper East, Lower East, Central Wetland and three lake areas. The species composition and relative abundance between wetland and lake area was compared to understand the avian habitat. A total of 94 species (95.92% of all recorded species) and 36 families were recorded in wetland area and a total of 31 species (31.63% of all recorded species) and 22 families were recorded in lake area. Out of the total, 74 bird species belong to resident birds (75.51% of all recorded species), 14 species resident & migrant birds (14.29% of all recorded species), 6 species migrant birds (6.12% of all recorded species), 2 species vagrant birds (2.04% of all recorded species) and only 1 species (1.02% of all recorded species) represent introduced birds. The results for feeding guilds based on detected number of species were compared to understand the habitat preference and food resources of wetland and lake area at Putrajaya. The results indicated that Insectivore (Wetland; 27.66% and Lake; 32.26%) was the most dominant group of birds in both area. In contrast, Frugivore/Nectarivore (1.02%), Granivore/Frugivore/Insectivore (1.02%) and Granivore/Insectivore (1.02%) were the rarest group of birds in wetland area, while the two feeding guilds namely; Frugivore/Nectarivore and Granivore/Frugivore/Insectivore were absent in the lake area. This group is extremely variable in term of species composition, relative abundance, diversity, feeding guilds, density and habitat selection. The presence or absence of a particular bird species may show the ecological condition of the area.

S07.OC.04

Dammed rivers and vegetation changes in Amazonia

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In Amazonia, many large rivers have already been dammed or are in various stages of planning in order to provide energy from hydroelectric plants. Once dammed, rivers turn into huge lakes which flood the original vegetation in the former river basins. Mountains are left as islands in these artificial lakes. The former vegetation suffers from the strong impacts of fragmentation, including microclimatic changes (e.g., artificial edge habitats, erosion, dessication from wind, and altered rainfall patterns) as well as effects of flooding on previously unflooded soils. These conditions lead to high mortality rates of indigenous trees unless they are pre-adapted to wet conditions and to shifts in floristic composition. In this presentation we analyze the short-term responses of Amazonian vegetation units, and medium-term response 15 years after flooding in Lake Guri, Venezuela.

S07.OC.05

Land-use history and flood regime affect woody biomass accumulation in Amazonian floodplain forests

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Land-use and hydrology are major drivers of wetland ecosystems, but their effects on woody biomass production of the world's largest and most diverse floodplain ecosystem are largely unknown. We fill a gap in ground-based data for aboveground woody biomass (AGB) and biomass accumulation in secondary floodplain forests of the Eastern Amazon dry corridor, a region of high risk to carbon loss via drought and deforestation. Aboveground woody biomass of seasonally flooded forests were monitored over nine years in 43 plots of 0.1 ha across flood level, forest age, and cattle density. AGB (212 ± 96 SD Mg ha^{-1}) was affected by the interaction of flood level and forest age, while flood level was the sole driver of spatial variation in net annual biomass accumulation. Net annual biomass accumulation varied widely among forests (6.4 ± 11.8 SD Mg ha^{-1} y^{-1}), due to large differences in stem growth increment and stem mortality. Forests had high biomass gains (18.5 ± 9.5 Mg ha^{-1} y^{-1}), but lost 66 ± 81% of total biomass gained to stem mortality. Net annual biomass accumulation declined with increasing flood levels and tended to be higher in younger forests. Stands with heavy livestock impact had low biomass accumulation and low species richness, but did not suffer higher mortality or lower recruitment rates, as expected. Our results suggest that secondary floodplain forests annually sequester substantial carbon as woody biomass, but have large losses to stem mortality, a potential result of both natural and anthropogenic disturbance. Based on these results, the region may show declines in richness of low-flood-tolerant tree species as well as carbon sequestration by AGB with observed increases in extreme flooding events and land-use intensification.

S07.OC.06

Endemism and the neotropical distribution of Amazonian white-water floodplain trees

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Besides numbers on species richness and diversity, the amount of endemic species is widely used for the definition of ecosystem, ecoregion and/or biome conservation priorities. However, most Amazonian forested ecosystems lack reliable estimations about the degree of endemism, i.e. by indicating numbers of endemic tree species. Amazonian white-water (várzea) floodplain forests cover an area of approximately 400,000 km^2. Várzea forests are considered the most species-rich floodplain forests worldwide. Its tree species tolerate seasonal inundations of up to 8 m in height resulting in the annual inundation of roots, parts of the aboveground organs, or the entire trees for periods of up to 230 days $year^{-1}$. We reviewed the flora of the Amazonian várzea to check for the amount of its endemic tree species and to test whether endemism is related to geographic and/or flood-induced gradients. Our data consist of 61 forest inventories that cover an area of > 100 ha, and that account on 92,000 individuals belonging to 1014 flood-tolerant tree species. We classified species according to their flood-tolerance in low-várzea species (flood height > 3 m, flooding period > 50 days $year^{-1}$) and high-várzea species (flood height < 3 m, < 50 days $year^{-1}$), and according to their occurrence in western Amazonia, central Amazonia, and eastern Amazonia. Presence or absence of várzea tree species in other, flooded and non-flooded ecosystems and biomes comprising the entire Neotropics were investigated in the most important herbaria, floras and species lists.
Our results indicate that approximately 20% of all Amazonian várzea tree species are restricted to flooded habitats or ecosystems of the Neotropics, and that 11% are endemic to Amazonian várzea. The highest proportion of endemism occurred in the central part of the Amazon basin and in highly flooded low-várzea forests. In contrast to most other tropical floodplains, where past climate change repeatedly interrupted evolutional processes of wetland-specific floras and where endemic tree species are rare or even absent, the comparatively long floristic evolution of the Amazonian floodplains favoured the development of flood-specific adaptations leading to high degrees of endemism. Our results contrast the maps of Amazonian lowland areas of endemism which mostly were developed on ranges of terrestrial organisms, and which consider rivers to be powerful distribution barriers. Instead, we suggest that flooding is an important driver of speciation processes and the development of endemic tree species, and thus of importance for Amazonian biodiversity as a whole.

S07.P.01

Spatial distribution of floristic composition in altitude wetland of Catarinense plateau, Southern Brazil

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The Catarinense Plateau localized in Santa Catarina State presents typical wetlands, locally called altitude wetlands or '*banhados'*. They occur in small and medium sized extensions, are frequent and occur intermingled to the meadows in altitudes between 800-1600m. However these wetlands are suffering great losses to agriculture and animal product expansion, since those productive activities frequently cause drainage and degradation of this environment. The aim of this research was to analyze the spatial distribution of floristic community at Bom Jardim da Serra City wetlands (28º19'53.85"S, 49º40'46.24"W, 1213m a.s.l.). The floristic survey was carried out in January 2012, using transects method. 54 sampling pattern units (1m^2 PVC quadrant) were positioned along two aleatoric transection lines. Data was collected and sample spatial distribution was registered using a Cartesian coordinate system, including all the samples present inside the pattern, including those in vegetative condition. Graphic representation and statistical analyses used R software, free source. 76 species, 40 genera and 27 families could be recorded. Most family (0.55%) and genera (0.38%) were represented by a single species, indicating high richness in the studied area. Families with highest richness were Poaceae (15 species), Asteraceae (15 species) and Cyperaceae (11 species). They also presented the highest abundance and occurred in all the sampling units. Families Lamiaceae and Xyridaceae showed up only in the beginning of transections, and Rubiaceae and Onagraceae occurred in the center of wetland. Richness and abundance of species varied along the transections, some species occurring next to the board and others in the middle of wetland. Only a few species occurred along all the transection, as example, *Senecio* sp., *Andropogon lateralis* and *Baccharis trimera*. Thus, present study offered an opportunity to start the register on spatial distribution of botanical species in Southern Brazil wetlands, and recognition could be a start to its preservation.

Key-words: Freshwater wetlands, Swamp, '*Banhado*', Beta diversity.

S07.P.02

Specific leaf area and foliar $\delta^{13}C$ in mangrove areas of Ilha do Cardoso, southeast coast of Brazil

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Specific leaf area (SLA) and leaf carbon isotope ratio ($\delta^{13}C$) are key functional traits that integrate aspects related to the carbon balance and leaf water-use efficiency of C_3 plants which can largely influence nutrient dynamics. Aiming to provide useful information to predict impacts of N enrichment in mangrove areas leaf N and C concentration and $\delta^{13}C$ were measured and the SLA calculated. Leaf samples of 108 individuals of *Rhizophora mangle* L., *Avicennia shaueriana* Stapf & Leechm. ex Moldenke and *Laguncularia racemosa* (L.) C.F. Gaertn. were collected in the State Park of Ilha do Cardoso (25°04'48.42"S, 47°56'58.76"W), São Paulo state in two mangrove formations (Fringe and Basin). *A. shaueriana* showed the highest SLA (median= 80.1 $cm^2.g^{-1}$, coefficient of variation= 21.1%, n= 11), followed by *R. mangle* (53.8 $cm^2.g^{-1}$, CV= 23.5%, n= 84) and *L. racemosa* (45.4 $cm^2.g^{-1}$, CV= 18.6%, n= 13). The SLA in Fringe (54.8 $cm^2.g^{-1}$, CV= 24.3%, n= 45) was higher than in Basin (45.6 $cm^2.g^{-1}$, CV= 15.4%, n= 24). SLA was positively correlated to leaf N concentration (r = 0.7610) and negatively correlated to C/N ratio (r = -0.7595). The formations did not differ in N concentration and C/N ratio. The $\delta^{13}C$ was higher in Basin (mean ± standard deviation: -26.37 ± 0.64‰) than in Fringe (-28.42 ± 1.60‰). Lower SLA and higher $\delta^{13}C$ in Basin may reflect lower nutrient availability and/or higher water limitation.

S07.P.03

Phylogenies help to uncover diversity patterns in Neotropical Amphibians

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Biological diversity is a multifaceted concept. In the last decades, there is a growing interest in incorpoting phylogenetic information into traditional diversity measures. Here I present results from a preliminar study about diversity patterns of a tadpole metacommunity in Southeastern Brazil. I analyzed how the phylogenetic structure of this metacommunity is influenced by pond canopy cover gradiente, pond area, floating vegetation, and depth recorded in 13 ponds. I used Principal Coordinates of Phylogenetic Structure to describe the structure of the species composition matrix wheighted by phylogeny. Then, I performed a db-RDA (Capscale) to relate environmental variables with descriptors of phylognetic structure. I found that clades are divergent in their response to two main environmental variables: canopy and floating vegetation. The db-RDA model explained 52% of the data ($P < 0.05$). Furthermore, the two main clades of hylids (Cophomantini and Dendropsophryni) were positively affected by canopy cover, contrarily to Cruciabatrachia and Microhylidae. Previous studies found that canopy cover and floating vegetation were the main drivers of tadpole metacommunity structure. Therefore, these same variables seem to be sorting not only species but also entire clades. Phylogenies are usually considered a multivariated proxy for relevant biological traits, often not directly measured on individuals. I argue for the inclusion of functional traits into the analysis of diversity patterns in amphibian studies, along with phylogenies, spatial structures, and environmental variables.

S07.P.04

Breeding biology of the Yellow-Crowned Night-Heron (*Nyctanassa violacea*) in a Natural Reserve, Parque do Pereque, Parana, Brazil

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This study focused on the breeding biology of the Yellow-Crowned Night-Heron (*Nyctanassa violacea*) in a mangrove site in the “Parque Natural Municipal do Manguezal do Rio Perequê”, Pontal do Paraná, Paraná, Brazil. Breeding seasons occurred between August and March and most of reproductive activities are during September to November. Eighty four nests were monitored in the breeding seasons from 2005 to 2008. We found 65.5% as active nests: 19 nests in the first breeding season, 16 in the second and 20 in the third year. An estimate of the reproductive population each year was 38, 32 and 40 individuals respectively. Clutch size was two to five eggs per nest. The egg/nest ratios were 2.6, 2.1 and 2.7 per breeding season. Hatching rate was 64%, 21% and 51% per season, while the fledgling rate (the second period after hatching) was 8%, 7% and 6%, respectively. In the first breeding season we registered the higher breeding success ratio, and in the second season we observed the lowest ratio. The breeding population size was relatively stable during the study, probably regulated by extrinsic factors as reduction of local mangrove area. The reproduction activity period as well as the clutch size may be related to food availability and weather condition. Predation and weather conditions may influence the eggs and chicks loss on the first stage. We found that only half of the eggs laid per season can reach the second stage of development. The Yellow-crowded Night-heron breeding success depends on a safe nest site, thus the mangrove area of the reserve must be preserved to the maintenance of the local breeding population of this vulnerable species.

S07.P.05

Prey consumed by Yellow-crowned Night-heron (*Nyctanassa violacea*) in a mangrove site in the state of Paraná, south Brazil

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Prey consumed by Yellow-crowned Night-herons in a mangrove site on the coast of south Brazil (Parque Natural Municipal do Manguezal do Rio Perequê) were identified based on pellets and regurgitated food. Pellets and regurgitated food were collected from 10 nests during the breeding seasons of 2006/2007 and 2008/2008. The most frequent prey-items were crabs. Eighteen prey-taxa were identified, 14 of which were crabs, and the remaining shrimps and bone fish. The most frequent prey-taxa were the crabs *Ucides cordatus* (54.5%), *Eurytium limosum* (15.6%) and the “Morphotype 1” (i.e., *Sesarma rectum* or *Neohelice granulata*) (10,3%). Most crab claws (especially of *U. cordatus* and *E. limosum*) has 5,4–16,54 mm in length, suggesting some prey size selectivity by birds. Besides the food items description, the results also points a significant connection of this vulnerable species to the mangrove, a threatened habitat, as a preferential feeding area.

S07.P.06

Investigations on seasonal variation in physicochemical and phytoplankton analysis of Shaheed Ziaur Rahman Medical College and Hospital premises fishpond inside Bangladesh

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The wealth of life forms found on earth including the millions of plants, animals and microorganisms, the genes they contain, and the ecosystems they form. Duckweed is a small floating aquatic plant. It is highly nutritious food for fish, poultry, and livestock. In the present investigation, bioaccumulation process of heavy metals has been examined in duckweed (first trophic level), and in insect (second and successive trophic levels). The experimental site had been selected at the Shaheed Ziaur Rahman Medical College and Hospital of Bangladesh premises. An attempt was made on the experiment of bioaccumulation process via duckweed to insect in two different fishponds named as (organic fishpond and inorganic fishpond). In organic fishpond hospital waste materials were used as duckweed nutrients. In inorganic fishpond inorganic fertilizers were used as duckweed nutrients. Heavy metals in aquatic habitat were transmitted and persistence in duckweed and from duckweed transmitted to insect. The insect larvae are duckweed consumer in the fishpond ecosystem. Consequentially the persistence of heavy metals were noticed in the insect when it larval stages were examined. Nine trace and heavy metals {Lead (Pb), Cadmium (Cd), Copper (Cu), Zinc (Zn), Manganese (Mn), Nickel (Ni), Cobalt (Co), Chromium (Cr), Iron (Fe), and Mercury (Hg)} were analyzed by atomic absorption spectrophotometer. All of these trace metals (trace amounts concentration) was higher in organic fishpond than in inorganic fertilizer fishpond water. Some of these trace metals were found to pass from water to duckweed and in the larval body. Some essential metals Iron (Fe), Manganese (Mn), and Nickel (Ni) were evidenced at high concentration in water, duckweed and insect larvae. The experimental result indicated that persistence of heavy and trace metals is occurred in successive trophic levels when they indicated in aquatic habitat and the habitat contains metals.

S07.P.07

Ants as bioindicators of environmental degradation in the Brazilian Savannah Wetlands.

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The Veredas, a Brazilian Savanna wetlands is an ecosystem formed on sandy soils with high concentration of peat, and responsible for recharge of aquiferous reservoirs. Brazilian Savanna is one of the most threaten Neotropical biomes, suffering loss of biodiversity, invasion of exotic species, soil erosion, and pollution of aquifers. This study aimed to evaluate the environmental degradation of the Veredas in different seasons, using the ant assembly as biological indicators of recovery. We selected two Veredas impacted by eucalyptus monoculture and two well preserved, subdivided in three habitats: floodplain, cerrado and monoculture. Ant sampling was conducted in May 2010 and February 2011, using three complementary methods, namely, sardine+honey baits (arboreal and soil), pitfall traps (arboreal and soil), and direct collection. A total of 20.247 ants were sampled, belonging to 37 genera and 168 morphospecies. Among these, Myrmicinae and Formicinae where the most abundant, with 93 and 38 species respectively (77.97 % of the total). *Pheidole* and *Camponotus* were the genera with the highest number of species (37 and 34 species, respectively). It was observed that the abundance and richness of ants varied significantly between veredas and habitats. The landscape simplification caused by monoculture seems to reduce the number of ants species and individuals, and favoured generalist species. Only the abundance varied significantly with seasons, as wet seasons presented greater ant abundance. Such increase in activity may reflect greater availability of resources that may thrive the colony. Despite of high ant species diversity even in the impacted veredas, which suggest some faunal resilience to the surrounding disturbances, changes in the functional guilds species distribution among areas may reflect vegetation structure changes or lost of habitat quality/integrity. Acknowledgments: FAPEMIG.

S07.P.08

STRUCTURAL CHARACTERIZATION OF AQUATIC MACROPHYTES IN NORTHEASTERN AQUATIC ECOSYSTEMS1

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The majority of aquatic macrophytes are terrestrial vegetables which, in the course of their evolution process, readapted themselves to the aquatic environment with a strong capacity of adaptation to different types of environments. The objective was to analyse the structure of the aquatic macrophytes community in springs located in the areas of influence of the Project of Integration of the São Francisco River (PISF) during the dry season. Aiming to characterize the structure of aquatic macrophytes community, two springs were selected: the Atalho Dam (CE) and the Engenheiro Ávidos Reservoir (PB). For each environment, three 20-meter transects were allocated randomly, directed towards the interior margin of the springs. At each 2m, parcels of 0.25 m² (5m x 5m) were plotted, counting all species and individuals. For the structural characterization of the community, the relative frequency of the species and the family and the diversity index of Shannon-Weaver were analysed. The highest frequency values occurred in the Atalhos Dam, due to the strong presence of the Asteraceae family (32.9%) and in the Engenheiro Ávidos Reservoir, due to the Boraginaceae family (25.13%). The most frequent species found were *Enydra radicans* (Willd.) Lack (22.6%) and *Euploca procumbens* (Mill.) Diane & Hilger (26.4%). The diversity in the Atalhos Dam (H'= 1.757 nats/ind) and in the Engenheiro Ávidos Reservoir (H'= 1.923 nats/ind) was relatively high, and the concentration of species was low. In spite of having different formation origins, they are floristically similar and may present similar biotic and abiotic characteristics, influencing the colonization, succession and stability processes of the macrophytes communities in the Caatinga. Understanding the dynamics of aquatic ecosystems is very important, since they provide subsidies for the implementation of conservation policies for aquatic biodiversity.

Keywords: Aquatic Macrophytes, Structure, Caatinga, Reservoir

S07.P.09

Composition and structure of the lacustrine bird communities of seasonally flooded wetlands of western Brazilian Amazonia at low water

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Seasonally flooded forests occupy 400,000 km^2 in the Amazonian lowlands. The human rural population is concentrated along major rivers and adjoining wetlands, making them the most threatened Amazonian ecosystems. Aquatic birds are ubiquitous and often abundant, but variation in the composition of their communities and its determinants remain largely uninvestigated. This hampers the knowledge of their contribution to local and regional biodiversity, their importance as top predators and controllers of organisms at lower trophic levels, and the evaluation of their usefulness as indicators of environmental change. In September, the annual flood recedes and water level attains its lowest values at the Mamirauá and Amanã Sustainable Development Reserves (SDRs), Amazonas, Brazil. A "Swiss cheese"-like landscape is created, with hundreds of lakes of different sizes scattered over a vast wetland area, and a wide variety of aquatic habitats. Aquatic birds differ in ability to colonize these enviroments, causing spatial variation in abundance and community composition, both locally and regionally. We hypothesize that variation in bird community composition follows gradients in ecological factors of the lakes. We conducted 5 km transect surveys by speedboat in several lake systems of both SDRs in September 2004. The results revealed that the low water aquatic bird communities of the Mamirauá and Amanã lakes comprise a few abundant species and many rare species, typical of tropical communities. Most species are strictly aquatic, and many are piscivorous. Significant variation among lake systems occurred only for the piscivorous quantitative community. Lake shape, depth, and isolation, and water transparency, all affected qualitative and/or quantitative aquatic and/or piscivorous community composition.

S07.P.10

The role of giant armadillos (*Priodontes maximus*) as physical ecosystem engineers in a Neotropical wetland

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An ecosystem engineer is an organism whose presence or activity alters its physical surroundings or changes the flow of resources, thereby creating or modifying habitats and influencing all associated species. Burrowing species, although at a more modest temporal and spatial scale may have the same fundamental effects. One of the most fossorial and striking species of mammals is the giant armadillo (*Priodontes maximus*) which can reach up to 150 cm, weigh up to 50 kilograms and is characterized by large scimitar-shaped fore claws, the third of which is greatly enlarged. Although giant armadillos range over much of South America almost nothing is known about them and most information is anecdotal. Due to its cryptic behavior and low population densities, this animal is very rarely seen. The giant armadillo is threatened with extinction and is currently classified as Vulnerable (A2cd) by the IUCN/SSC. The Pantanal Giant Armadillo Project was initiated in 2010 at the Baia das Pedras Ranch in the Nhecolandia sub region of the Brazilian Pantanal to investigate the ecology and biology of the species and understand its function in the ecosystem. Using camera traps strategically placed at the entrance of giant armadillo burrows the undocumented important role of giant armadillos as physical ecosystem engineers and was revealed. Over 55,000 pictures were taken in two years and over 25 species of vertebrates where documented using giant armadillo burrows as a thermal refuge, shelter against predators, feeding ground. In addition many species were documented using the sand mound in front of the burrow. Due to seasonal flooding availability of natural underground cavities or holes is very low in the Pantanal. The role of this poorly known species as physical ecosystem engineer may be of high value to the community of vertebrates in the Pantanal and other regions in its extensive range.

S08.OC.01

The evolutionary history of the Cerrado flora

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Modern savannas are thought to have evolved within the last 8 million years (Mya), coinciding with the rise to dominance of flammable C4 grasses and the consequent expansion of fire-prone grass dominated ecosystems worldwide. Recent studies focused on the Cerrado in South America, the world's most species-rich tropical savanna, have provided insights on the origins and historical assembly of the savanna biome. Dated phylogenies show that Cerrado lineages started to diversify less than 10 Mya, and are characterised by fire-resistant traits such as thick, corky bark and root sprouting. We present evidence to demonstrate that the evolutionary barrier to entry to the Cerrado is a weak one, presumably because of the ease of evolution of the necessary adaptations to fire regimes for lineages inhabiting neighbouring fire-free biomes. The rich Cerrado flora is composed of multiple independent lineages in disparate plant families, and that the key adaptive shift has been to cope with fire. The frequent adaptive shifts and phylogenetic overdispersion in Cerrado plant communities suggest that fire does not pose a significant adaptive barrier. In the case of the Cerrado, biome boundaries appear to have been permeable to the ingress and recruitment of lineages from a range of fire-free vegetation types, suggesting lack of phylogenetic niche conservatism, which resulted in a mixture of elements of various provenances and floristic affinities. The emerging picture of Cerrado origin based on dated phylogenies, phylogenetic community structure, and population genetics, is of geologically recent diversification of endemic plant lineages, driven by the common trigger of fire adaptation and facilitated by ease of adaptation across diverse plant groups.

S08.OC.02

Small-mammal diversity in the Brazilian Cerrado: patterns of alpha and beta diverstiy across habitat types

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Ecologists and conservation biologists are keenly interested in how patterns of species diversity change across spatial scales in the Cerrado region, one of the world biodiversity hotspots. The objectives of our study were to evaluate the patterns of genera diversity of small-mammal assemblages in the Brazilian Cerrado. Specifically, we investigated how small-mammal alpha and beta diversity vary among habitat types. We analyzed distribution patterns of rodents and marsupials and their association with 10 habitat types, including open areas (e.g. wet grasslands, dry grasslands, rocky fields), savanna formations (e.g. cerrado *sensu stricto*) and forested habitats (riverine forests, mesophytic forests). We used data gathered from published and unpublished sources covering most of the Cerrado geographic distribution (total of 151 sites), recording 38 small-mammal genera. Differences between communities were not correlated with their geographic distance ($P > 0.4$), indicating the influence of local factors and habitat type on community patterns. Rarefaction curves indicated a positive relation between complexity and richness, but besides the forested habitats one kind of open savanna formation (campo cerrado, dominated by shrubs with sparse trees) also had a high richness of genera. Open areas mostly had lower richness, mainly rocky grasslands. Community composition varied significantly across habitat types (ANOSIM, $r = 0.52$, $P < 0.001$). The wet grasslands differed significantly from other open-area formations and the riparian forests were different from mesophytic forests. Inter-habitats beta diversity seems to be important for the overall diversity of the Cerrado biome. Our results reinforce the need for several protected areas representative of distinct habitat types and in different regions for the adequate conservation of the mammalian diversity of the Cerrado.

S08.OC.03

Plant demography in political, agricultural, and biological hotspot

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Plant communities in Paleotropical savannas are regulated by a combination of pervasive bottom-up and top-down effects. However, the paucity of ungulates and other large herbivores in Neotropical savannas has led to speculation that these communities are primarily structured by physical factors such as fire, precipitation and soil chemistry. While the importance of abiotic drivers in Neotropical savannas is indisputable, the available evidence suggests asserting their primacy is premature. Empirical studies quantifying the impacts of herbivores in Neotropical savannas such as Brazil's Cerrado are extremely rare, making it difficult to assess the relative importance of top-down and bottom-up effects. Furthermore, although mammalian herbivores are indeed less abundant, Neotropical savannas contain a diverse community of insect herbivores. This community includes species such as leaf-cutter ants (Atta spp.), which are conspicuous throughout much of tropical and subtropical America and are the dominant herbivore in many locations. I review our current understanding of how Cerrado plant demography is influenced by consumers such as herbivores and seed predators, including experimental results on seed predation and herbivory. I then use matrix models to compare the consequences of consumption for a suite of Cerrado tree species. Finally, I place these results in the broader context of the relative importance of top-down and bottom-up effects.

S08.OC.04

Leaf herbivory and decomposability in cerrado plants.

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Herbivory and leaf-litter decomposition are key ecosystem processes. Traditionally, studies have focused on just one of these processes, but it is becoming clear that herbivory can directly and indirectly affect decomposition. For instance, many leaf traits that have apparently evolved as defensive mechanisms against herbivores may also affect decomposer performance. The *Cerrado* is the most diverse and threatened savanna biome of South America. Perhaps because these savannas lack mammalian herbivores and because fire is assumed to largely control nutrient cycling, studies on herbivory and litter decomposition in the Cerrado are rare. For three consecutive years we assessed herbivory rates in 24 cerrado (savanna) tree species. Decomposition rates of leaf-litter produced by these same tree species were estimated in two consecutive years. Herbivory rates varied strongly among tree species but only a relatively small part of this variation was explained by the leaf traits we measured. Inter-specific variations in decomposition rates were less pronounced and here again only a small part of the observed variation was explained by the nutritional and defensive characteristics measured. Significant inter-annual differences in herbivory and decomposition rates were detected, but the magnitude of this effect was much greater for herbivory than for decomposition. For most species, herbivory rates declined substantially along the three years of our study. We attributed this to temporal changes in the abundance of insect herbivores (especially grasshoppers) that were probably associated with fire disturbance. In most comparisons there was a positive association between herbivory and decomposition rates indicating that similar suites of plant traits govern foliage palatability and litter decomposability in Neotropical savannas. Insect herbivory, assumed to be relatively unimportant in these savannas, can be quite high in some species and years and thus act as an important selective and ecological force.

S08.OC.05

Temporal patterns of fruit color and contrasts in a cerrado-savanna plant community

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Fruit color is an important signal for diurnal seed dispersers. However, the contrast between the fruit and the background is regarded as more important than the color per se for fruit detectability. The contrast between fruit displays and their background are not necessarily constant in seasonal habitats where part of leaves is shed in the dry season. We tested whether there is a seasonal pattern of fruit color and if this pattern changes over time in order to favor fruit contrast and detectability in a cerrado-savanna vegetation, southeastern Brazil. We describe the fruiting pattern according to the fruit color (red, yellow, black, dark red and multicolored) for 1468 individuals of 64 species, sampled in 36 transects. We accessed the percentage of trees and species fruiting per month over six years, and estimated fruit biomass in one year. We ask whether there are: (i) differences in the reflectance spectra of the background of leaves between wet and dry seasons, (ii) differences in the contrast between the reflectance spectra of fruits and the leaves in the fruiting period and fruits and leaves in the dry season. The reflectance spectra were measured with a spectrometer that includes the visual system of birds. Fruits of diverse colors differed with respect to fruiting onset and peak of fruit biomass. Black, and particularly, red fruits were highly seasonal, peaking in the wet season, while multicolored and yellow fruits were less seasonal, not limited to the wet season. We also found that the contrast between fruits and leaves were higher in the fruiting season than against leaves in the dry season. The seasonal variation in fruit colors observed in the cerrado-savanna may be, at least partly, explicable as an adaptation to ensure high conspicuousness to seed dispersers. (Financial support: FAPESP, CNPq)

S08.OC.06

Rainfalls does not explain nutritive plant status differences between two communities from the core and periphery of the Brazilian savanna vegetation

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The cerrado vegetation holds the largest flora among tropical savannas around the world. The aim of this study was to evaluate whether annual rainfall could explain differences in the nutritive status and functional parameters between two cerrado plant communities from the Central and Southeastern Brazil. This study was conducted in a wet season, evaluating soil fertility indexes, leaf concentrations of macronutrients and aluminum (Al^{3+}), as well as specific leaf area (SLA). For both regions we characterized the annual rainfall and air temperature, using a 30-year data set. We observed that in Central Brazil annual rainfall was higher than in the Southeastern region, but soils from both sites presented similar fertility parameters, including Al^{3+} contents. However, we found higher nutrient leaf concentrations and SLA in the Southeastern plant community compared with the plant community from Central Brazil. We also observed similar Al^{3+} leaf concentration in both communities, but several times higher concentration in Al-hyperaccumulator species from Central than Southeastern Brazil. These results invalidate our hypothesis that the greater annual rainfall in Central Brazil would cause greater exchangeable base leaching, resulting in low soil fertility and high Al^{3+} contents in the soil, consequently, in a lower plant nutritional status. We suggest that plants from the Southeastern border of the cerrado vegetation are under a great influence of forest environments, such as the Atlantic forest.
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S08.OC.07

Carbon Stocks Estimates in Cerrado and Pantanal Private Reserves, Mato Grosso do Sul State, Brazil

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Global warming has driven new trends for a clean development with low greenhouse gases emission, and carbon is central one in climate dynamics. Mechanisms keeping carbon stuck into soils and withdrawing carbon from atmosphere have been pointed out as needful actions for global warming mitigation. Here, we estimated the carbon amount in the Cerrado and Pantanal private reserves to evaluate how these areas can contribute for carbon maintenance. We settled 100 m^2 quadrats in different phytophysiognomies in five private reserves: Buraco das Araras (29 ha; 15 quadrats), Gavião de Penacho (77 ha; 11 quadrats), São Geraldo (642 ha; 24 quadrats) (Cerrado), Dona Aracy (5,603 ha; 28 quadrats), and Rio Negro farm (7,000 ha; 40 quadrats) (Pantanal). We measured plant circumference at the breast height (BHC) and at ground, plant height, and crown radius for all plants with BHC $\geq$ 5 cm within quadrats. To estimate aboveground dry biomass (ADB) and its respective carbon amount (ADB/2), six suitable allometric models were used. Average tons of carbon per hectare did not differ between Cerrado (65.6 ± 76.22; n = 48) and Pantanal (60.2 ± 70.98; n = 68). Comparing with other studies, our results are slightly higher than those found in African savannas (averages from 14 to 47 tonC/ha), and lower than in moist forests (83 to 162 tonC/ha), regarding to aboveground biomass reservoir. Vast Cerrado and Pantanal areas have been converted to agricultural or extensive pastures, often abandoned later due to its low productivity or expensive management. High regeneration potential and reforestation can quickly restore native vegetation in Brazilian savannas, rebuilding carbon stocks. Cerrado and Pantanal private reserves are efficient initiatives to replace carbon on the ground, attending the scope of Reducing Emissions from Deforestation and Degradation program of Climate Convention. Developed in partnership with REPAMS; sponsored by Petrobras Environmental Program.

S08.OC.08

Climate change, agriculture and conservation in the Cerrado and why it can be the next deforestation hotspot in Brazil

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Projections depicted in the Intergovernmental Panel on Climate Change (IPCC) last report reveal, in a consensual basis, that the Cerrado, along with a large fraction of the Amazon basin, are regions to be affected the most by climate change in Brazil. Besides the increase in temperature, there should be reduction of total rainfall and an increase in seasonality. The impacts of that are as diverse as can be. Concomitant to that Brazil's government and the agribusiness industry are planning a considerable increase in the supply of energy and infrastructure facilities to support the expansion of agricultural fields onto Cerrado lands. That is the case for example in the northern part of the biome, where soybean plantations are expanding at a fast pace, and in the biome's southern part, with the implementation of roughly forty new sugarcane mills (usinas). In addition, many scientific studies and institutional papers have been stating the intensification of cattle ranching in the Cerrado (which hosts ~50% of the national herd) would spare land for other uses, even though the past examples have shown that intensification of agriculture increases its economic attractiveness and in fact leads to expansion of cultivated or grazing land. And finally, the neighboring Amazon forest is passing through a non-precedent period of conservation efforts which, notwithstanding, might leak to the much less protected (e.g. in terms of conservation areas) Cerrado. This work intends to show how the interplay of these issues can turn the Cerrado – considered the most biologically diverse savanna in the world – into the next deforestation frontier and lead to significant environmental drop back in the region. It highlights the need for more protected areas in the Cerrado, as well as the same sort of public policies oriented for the Amazon in the last 7-8 years.

KEYWORDS: public policies; cattle ranching; ethanol; soybean; protected areas; Amazon

S08.OC.09

The effects of climate change on distribution and conservation of cerrado birds

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The cerrado is under fast development and conversion to croplands, despite its high diversity, characterizing it as a hotspot. Cerrado climate is predicted to change with an increase on average temperature of 3.5ºC by 2100. We tested the potential impacts of predicted climate-driven change on the distribution and conservation of 38 broad-range birds from the Cerrado biome, estimating current and future range and adequacy of protection (representation) in reserves of the Cerrado region. We used 12 bioclimatic variables, nine niche modeling techniques (eight within BIOMOD and Maxent), three General Circulation Models (GCMs) (CCCMA, HADCM3 and CSIRO) and two scenarios (A2a and B2a) each, for each species to model current distributions and their potential future projections. To reach a consensus scenario among different techniques, we used an ensemble forecasting approach. Then we compared current and future (2046–2060) distributions under two different scenarios (small and large reserve size and with and without bird dispersal) with the current Brazilian reserve system to estimate the adequacy of protection (representation) of each species and detect gaps in their protection. Change of range size under different scenarios varied among species from a 5% increase to a 80% decrease. The mean expected range shifts for each species were 175-200 km, and the shift was usually toward southeastern Brazil. None of the 38 species is properly covered by the current reserve system under any current or future scenarios. The predicted direction of range changes to southeast Brazil is cause for concern because ranges are predicted to shift to the most developed and populated region of the country. Our study also revealed that the current reserve system is highly inefficient in conserving the analyzed bird species. These pressures, associated with current expansion of biofuel agrobusiness, require new and non-traditional conservation measures for the Cerrado.

S08.OC.10

Demographic effects of road proximity and food availability on populations of a Neotropical herbivore in the Brazilian *Cerrado*

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Understanding how the spatio-temporal variation in landscapes affects species is a priority in ecology and conservation biology. Roads are prominent forms of landscape variation worldwide. To date the majority of studies investigating road effects suggest they are deleterious for most species. However, an overlooked issue is the potential for some species to benefit from road creation and expansion, resulting in dramatic increases in their populations. In the Brazilian *Cerrado*, a biome severely threatened by dense road networks, we examined the effects of road proximity on the local demography and population dynamics of a native Neotropical herbivore and crop pest, the leaf-cutter ant *Atta laevigata*. Their colonization is enhanced and recently established colonies have increased survival, growth and may not be limited by food near roads. We tested the hypothesis that road proximity would lead to increased population growth rates (λ) in the long-term, and that this pattern would be explained by the increased performance of early life-stages. During four consecutive years, we marked, mapped and monitored all mature *A. laevigata* colonies (nest mound size > 2 m^2) in a 19-ha *Cerrado* site surrounded by dirt roads. We also established demographic plots where colonies < 2 m^2 were monitored. Using demographic and previous experimental data we parameterized deterministic matrix population models, and found that populations near roads were growing 65% faster than those far from roads. Further supporting our hypothesis, elasticity analyses and a life-table response experiment (LTRE) showed that the life-cycle transitions that contribute the most for this pattern are directly related to survival and growth rates at early life-stages. These results suggest that disturbances such as road construction have a profound positive influence on *A. laevigata* populations, which may lead to the expansion of its range and the exacerbation of its many ecological and economic effects on *Cerrado* landscapes.

S08.OC.11

Why the Cerrado needs prescribed fire

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Fire has long been recognized as a natural process in savannas worldwide, being critical for maintenance of biodiversity. In protected areas of the Brazilian Cerrado, however, management practices have not promoted natural fire regimes. At the root of this policy is a perception that fire is unnatural, destructive, and not essential for the Cerrado. This perception is faulty. First, Cerrado plant species possess adaptations to fire that arose millions of years ago, consistent with the timing of the spread of savanna ecosystems in other parts of the tropics. Second, fire suppression results in a shift towards dense physiognomies, which leads to a decline in the species-rich groundlayer comprised of shade-intolerant species. This process of succession is quite slow, and therefore proceeds largely unnoticed under fire suppression. Finally, unwillingness to use prescribed fires results in destructive, uncontrollable fires that occur at times of years that are likely uncharacteristic of natural fire regimes. Fortunately, many conservation areas have not succeeded in suppressing fire entirely, and have therefore avoided the biodiversity loss observed in other savannas of the world under fire suppression. To avoid mistakes made elsewhere, management needs to quickly embrace a policy that includes prescribed fire.

S08.OC.12

Non-Timber Forest Products and Fire Management as Tools for Brazilian Cerrado Conservation - Research Priorities

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Sustainable use of the Cerrado natural resources is an important conservation strategy. Non-timber forest products (NTFP) management has been shown to improve local communities' livelihoods and generate up to USD 4,000/hectare/year. To improve NTFP ecological and economic benefits, research projects should seek to: (i) assess ecological impacts of harvest and management practices, proposing improvements when needed. Such studies should necessarily start from local ecological knowledge and management practices locally applied; (ii) improve harvesting, processing and marketing techniques to increase productivity reducing negative ecological impacts; (iii) characterize decision-making processes and challenges/bottlenecks that lead to maintaining natural vegetated areas that provide NTFP versus conversion to monoculture. Cerrado ecosystems management for NTFP, subsistence agriculture and cattle raising upon native vegetation frequently involves fire use. Cerrado has evolved with fire, however present fire regimes have been drastically altered by humans. Historically, the prevailing policy for the Cerrado, including Protected Areas, was to (tentatively) avoid fire completely. Recently, federal environmental agencies started to openly discuss fire management policies implementation, instead of just prevention and control actions. Fire management decisions shall consider adaptive management principles, being also based on local communities' practices and knowledge and, scientific research. Research priorities include assessments of: (i) wildfire spreading risk and behavior (e.g. effectiveness of forested areas and recently burned savanna physiognomies as fire barriers, in different regions); (ii) ecosystem and landscape fire effects, including the trade-offs among different biotic groups; (iii) indicators and parameters to guide management decisions dynamically; (iv) local communities' knowledge and fire management practices. Applied research may wisely inform fire management decision even when carried out in areas without implemented fire management policies. Considering the larger economic and political context and clearly identifying conservation goals and trade-offs involving both NTFP exploitation and fire management should always guide both research and management decisions.

S08.P.01

Negative effect of fluctuating asymmetry for the restructuring of *Vochysia thyrsoidea* after burning

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Plants that grow in stressful environments may present instability in ontogeny. This condition may be reflected in fluctuating asymmetries (FA), which are random variations in morphology that genetically should be symmetrical. These signs of weakness can be used as cues for herbivores, which are more successful in attacking plants with show FA. Our hypothesis was that plants with higher leaf asymmetry in post-fire events are more attacked by herbivores. We measured FA in four leaves from each of 12 individuals of *Vochysia thyrsoidea* (Vochysiaceae) in a recently burned area. The procedure was repeated in a neighboring preserved area, as a control group. Plants showed a similar asymmetry and herbivory independent of fire disturbance (Mann Whitney: $p > 0.05$, $n = 12$). However, there was a positive correlation between asymmetry and herbivory for plants in the burned area (Spearman coefficient = 0.61, $p < 0.05$, $n = 12$). Results indicate that *V. thyrsoidea*, a species well adapted to natural fire regime of the rupestrian fields (montane rocky outcrop vegetation in the Brazilian Cerrado), has low variation in leaf asymmetry after fire. However, asymmetry was highly variable among the individuals of *V. thyrsoidea*, and a gradient of asymmetry was found within the burned population. Interestingly, the variation in asymmetry was highly correlated with the gradient in herbivory suffered by the plant individuals only in the burned area, with the most asymmetrical individuals being the ones mostly attacked. Such selective pressure by herbivory can shape population, remain only individuals with low asymmetries as seen for the preserved area. Our results support a relationship of FA and herbivory being the fire, as stress factor common in rocky fields, not related to the FA. On the other hand, there are doubts that the FA would cause or consequence of herbivory. This work was supported by FAPEMIG.

S08.P.02

Nesting ecology of *Camponotus rufipes* and *Camponotus renggeri* (Hymenoptera, Formicidae) in cerrado savanna: nest structure and interhabitat differences

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Ants live in colonies housed in a nest space that serves to shelter the queen and brood, store food, and as coverage against variable conditions. Nest location determines where workers can forage, and a given species can use more than one type of nest depending on the availability of nest sites, nesting material or food, climatic conditions, or even season. Here we characterize the nests of *Camponotus rufipes* and *Camponotus renggeri*, two abundant cerrado ants that are similar morphologically and whose taxonomic boundaries are uncertain. We used honey/sardine baits (ground/leaves) to tag 26 nests of *C. rufipes* and 23 of *C. renggeri* in two cerrado physiognomies at Mogi-Guaçu (SE Brazil): *cerradão* (50-90% tree cover) and cerrado *sensu stricto* (»30% tree cover). We recorded habitat type, nest structure and nest persistence through time. While *C. rufipes* occurred exclusively in cerrado *sensu stricto*, 91% of *C. renggeri* nests were found in *cerradão* (G=52.2; p<0.0001), suggesting interhabitat variation between the species. Nest persistence after five weeks was higher for *C. rufipes* (88%) than for *C. renggeri* (18%) (G=23.35; p<0.0001). *Camponotus rufipes* occupied five types of nests: (1) dry straw on the ground or (2) vegetation, (3) erect or (4) fallen dead trunks, (5) beneath the ground. Four types of nests were identified in *C. renggeri*: (1) erect or (2) fallen dead trunks, (3) tussock grass, (4) beneath the ground. Nest categories are occupied in different proportions by the two ant species (G=75.18; p<0.0001). Whereas *C. rufipes* mostly builds dry straw nests (48%), *C. renggeri* nests frequently in fallen trunks (56%). Differences in habitat, nesting pattern, and behavioral ecology between *C. rufipes* and *C. renggeri* should constitute useful tools to identify species-specific traits, and thus establish clear limits concerning their taxonomic status. (FAPESP, CNPq, FAEPEX).

S08.P.03

Spatial distribution of *Calyptranthes brasiliensis* Spreg. in a palm swamp in the Environmental Protection Area of Pandeiros river, Minas Gerais State (Brazil)

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The knowledge of individuals distribution is important in strategies for environmental restoration, especially where the regeneration process is compromised. High frequency species in one area can present an aggregated distribution pattern, due to forms of reproduction and environmental factors that limit its distribution. A phytosociological survey carried out in a palm swamp (vereda) in the Environmental Protection Area of Pandeiros River (15°13'18"S, 44°55'21.2"W), *Calyptranthes brasiliensis* Spreg. stood out in juvenile individuals (≥1cm DBS-diameter at the base of the stem; ≤3cm DBH-diameter at breast height) and reached one of the highest Importance Values (IV) among adult individuals (≥3cm DBH). This study aimed to determine the spatial distribution of this species in this palm swamp. The adult individuals were sampled in 100 plots of 10 m x 10 m and the juvenile in 100 sub-plots of 5 m x 5 m. The average number of adult and juvenile individuals per plot was used to identify the spatial distribution pattern, by using the Poisson Index (PI), and χ^2 (chi-square) test, to establish statistical significance. We sampled 604 individuals, 515 juveniles and 89 adults. The average number of juveniles per plot was 5.05 (±9.55) and the IV of 17.75, showing a strong aggregation, while, for adults, the average number was 0.94 (±1.62) and IV of 2.74, indicating aggregated distribution, not as high as juveniles though ($\chi^2 = 59.33$ and $p < 0.001$). Biotic and abiotic factors influence the competition and regulation of species density, as the individuals grow a decrease in density occurs, therefore, the adults are more separated spatially. This pattern shows that there is a large number of juvenile individuals, as the stock of seedlings, which allows the maintenance of individuals and, therefore, of the population.

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S08.P.04

Vegetation Structure and Plant Area Index in a transition between Cerrado and Tropical Dry Forest in northern Minas Gerais

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The plant area index (PAI) is an important indicator of vegetation status, quantifying the exchange of matter and energy flow between the vegetation and atmosphere. We aimed to determine the variations in PAI and other structural parameters across a sharp transition between tropical dry forest (TDF) and the savanna-like vegetation of Cerrado. This study was conducted in the Area of Environmental Protection of the Rio Pandeiros, north of Minas Gerais, Brazil. We selected six TDF natural fragments in a matrix of Cerrado where we sampled 10 x 10 m plots in linear transects. In total, we sampled 180 plots in Cerrado, 243 in TDFs and 42 in transition between them. All individuals with circumference at breast height ≥ 10cm were identified and had their basal area measured. Plant height was also determined. In the center of each plot, one hemispherical photograph was obtained in both the dry and rainy season to estimate PAI and canopy openness (CO). Stem number and basal area were significantly lower in TDFs compared to the Cerrado and the transition. However, species richness was higher in TDFs but did not differ between the other two vegetation types. Plant height, PAI and CO differed between all vegetation types (TDF > Transition > Cerrado for the two first variables and the reverse trend for CO). Thus, these parameters are fundamental to mapping land cover and differentiating vegetation types through remote sensing. Temporal variations in CO were stronger in the TDF (50% from the rainy to dry season, respectively) and Transition (46%) compared to the Cerrado (36%), temporal changes in PAI were around 80% for all vegetation types. Plant height was the only structural parameter that affected PAI, but the low coefficient of correlation for this analysis prevents precise estimates of vegetation height using remote sensing derived PAI.

S08.P.05

Aligning Conservation of the Cerrado with Conservation of the Amazon

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One of the indisputable facts of Brazilian conservation is that the Cerrado gets only a fraction of the global attention (and resources) given to Amazonia. Of course, this discrepancy is partly due to the iconic status of the Amazon in global conservation as the World's largest and most biodiverse tropical forest. In this context, one innovative way to highlight the international importance of conserving the Cerrado is to link it with conservation of Amazon. Here, we demonstrate that continuing deforestation in the Cerrado will threaten the long term viability of Amazon forests using a coupled atmosphere-biosphere model combined with future forest governance scenarios in both ecosystems. Our analysis indicates that large segments of Amazonian lowland rainforest in the 'arc of deforestation' region may cross a critical climate threshold during the next 20 to 40 years, increasing the probability of transition to Cerrado or seasonal forest. Moreover, the model demonstrates that the level of conservation of the Cerrado will play a central role in determining the climatic conditions experienced by lowland Amazonian rainforests. These findings can be used for prioritizing future conservation efforts and add urgency and an important new dimension to arguments to halt deforestation the central Brazilian Cerrado. More generally, the study demonstrates the utility of coupled atmosphere-biosphere models for informing conservation planning and provides a valuable conceptual tool to more closely align the conservation of Cerrado with that of Amazonia.

S08.P.06

Does the use of herbicide in invaded areas favours the short-term regeneration of Cerrado?

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This study aimed to compare changes in the structural composition of areas under natural regeneration of Cerrado, using herbicide to control invasive grasses. We hypothesized that the use of herbicide to control invasive grass *Urochloa decumbens* (Stapf) R.D.Webster would allow the regeneration of species. As a consequence, the plant community free of invasive grasses would be more similar to natural areas of Cerrado. The study area are located within the Municipal Botanical Garden of Bauru – SP, comprising a fragment of Cerradão (CE), an area invaded by alien grasses without any intervention (SH) and an invaded area where the herbicide was applied (CH). CH and SH areas were cleared ten years ago and they have been abandoned since two years and thus, regeneration of natural Cerrado could be observed. We carried out the survey two years after the abandonment. 25 plots (10 x 10m) were established in CE, CH and SH. All woody plants with height ≤ 1m were sampled. We measured the basal area at 10 cm above ground. After a year, the surveys were repeated only in areas CH and SH. We analyzed the data using ordination methods (Principal Coordinate Analyses PCoA), applied to Euclidean distance between sampling units, with the following parameters: height, diameter, number of species and species composition. No clear differences could be observed in short-term between areas SH and CH and the use of herbicide did not enhance the regeneration of Cerrado woody species. However, areas under regeneration still differ from CE areas. Species composition from areas in regeneration (SH and CH) also differs from natural areas of Cerrado. Therefore, our results do not support our hypothesis. Long-term studies should be carried out in order to evaluate Cerrado regeneration in abandoned areas and the use of herbicide to enhance regeneration in Cerrado areas.

S08.P.07

The effect of converting Cerrado vegetation into agro-systems over the functional structure of native ground-dwelling ant communities

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One of the major threats for native biodiversity in the Cerrado biome is land-use change for agriculture purposes. Ants play major functional roles in ecosystems. However, the whole native community might not be able to persist in disturbed habitats. This study aimed to assess the impact of land-use change on the functional structure of ground-dwelling ant communities when native Cerrado vegetation is converted into monocultures. Ground-dwelling ants were sampled with traditional and subterranean pitfall traps, in six areas, each characterized by a natural reserve of Cerrado vegetation (forest and savanna) adjacent to monocultures. Species were distributed in eight functional groups following published classifications.The community functional structure between the reserves and monocultures, and then the three habitat types, was compared. The rarefied number and abundance of species per functional groups were statistically compared, and the Silvestre's index of functional similarity calculated. A total of 199 and 101 species in reserves and monocultures, respectively, was collected. As expected, the average rarefied species richness per functional group in reserves was significantly higher than in monocultures. Camponitini was, by far, the functional group most affected by this species loss, followed by the Generalists. Although only the species abundance per functional group for Camponotini and Arboreal groups was significantly greater in reserves than in monocultures, the Predators followed this trend too. The functional similarity value between reserves and monocultures was 67.3%. The savannas appeared more functionally similar with monocultures than with forests (88.7% *versus* 80.7%, respectively). The conversion of native vegetation into monocultures caused a decrease of species richness and abundance in functional groups, and a notable global functional loss. Thus, simplifying the vegetation complexity disadvantaged species with specialized nesting or food requirements, by decreasing resource availability. However, native savanna systems seems more functionally similar with intensive agro-systems than forests.

S08.P.08

Effect of increased nitrogen deposition on leaf litter decomposition and soil microbial activity in the Cerrado vegetation, Brazil

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Human activities more than doubled the atmospheric input of nitrogen (N) into terrestrial ecosystems. Because most of these ecosystems are N limited, increased N deposition can affect key ecosystem processes. To determine the effects of increased N deposition on leaf-litter decomposition and soil microbial activity, a fertilization experiment was carried out in a savanna (*cerrado*) reserve near Uberlândia, Brazil. Experimental plots were subjected to three treatments: high N addition (50kg N ha^{-1} yr^{-2}), low N addition (10kg N ha^{-1} yr^{-2}) and control (no addition). N was added as NH_4NO_3, in six applications per year, starting in 2007. Rates of decomposition were estimated using litterbags containing 10g of leaf litter produced by *Tristachya leiostachya* (the dominant grass in our study site) growing in plots subject to different N addition treatments. Under laboratorial incubation, same soil microbial and biochemical indicators were evaluated in soil samples from field, such as soil respiration, microbial biomass carbon, microbial metabolic quotient (qCO_2), and β-glycosidase enzyme activity. The soil NH_3 residual was also quantified in laboratorial assay. Overall, litter decomposition was faster in the high N treatment, but this effect was variable among the three years of our study. Moreover, litter originated from plants growing in the high N addition plots decomposed faster than that from plants from the other treatments. N addition did not alter soil NH_3 residual or changed microbial biomass carbon. However, soil respiration and β-glycosidase activity were significantly greater in the high N than in the low N and control plots. Furthermore, qCO_2 tended to increase in the high N treatment. These results suggest that N addition can accelerate decomposition directly – by increasing microbial activity – and indirectly by affecting litter quality.

S08.P.09

Estimation of the speciation rate for the Cerrado biome

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The unified neutral theory of biodiversity and biogeography (UNTBB) presents the unified biodiversity number Θ as the product of speciation rate and metacommunity size J_M ($\Theta=J_M*v$). Θ can be easily achieved by fitting the species abundance rank with Hubbell´s algorithm. With knowledge about the size of J_M, speciation rate can be computed. Objective of this study is to estimate the speciation rate of the Cerrado biome from the best fit of Hubbell´s algorithm for a species abundance distribution from a phytosociological survey. For that, the 959 trees with diameter at soil level equal or greater than 3.2cm within a 0.5ha plot from Martinho Campos, MG, Brazil, have been identified. The species rank of the 47 species was fitted using Brian McGill´s MatLab extension hubbell.m. Best fit shows migration rate of 0.65 and Θ of 11. J_M is calculated from the extension of the Cerrado biome (2,036,488km^2) and the average number of trees per km^2 (959/0.5ha is 19180/km^2) to $3.81*10^{11}$ individuals. Therefore, the speciation rate (J_m/Θ) is $2.82*10^{-11}$. If we now assume an average of 150 years from birth to death of an individual tree, we could estimate the number of birth (and death) events to 2.6 billion in the whole Cerrado biome within one year. This figure multiplied with the speciation rate gives the amount of new species per year (0.07). Its reciprocal (13.6) is the average time in years between two speciation events in the Cerrado biome. As number of species should be more or less constant, extinction rate should have the same magnitude as speciation rate in an undisturbed metacommunity at equilibrium. Consequently, one tree species going extinct in about 14 years in the Cerrado might be interpreted as natural extinction rate. More extinction events should be interpreted as the result of anthropogenic impacts.

S08.P.10

Ecological functions performed by dung beetles in Cerrado's pastures

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Dung beetles are closely linked with mammal's faeces due to their nesting behaviour and alimentary needs. Due to faeces manipulation, dung beetles are responsible for several ecological functions: nutrient cycling, soil bioturbation and parasite suppression. The use of endectocides (e.g.ivermectin) in livestock, involves a worldwide concern due to its potential risks on non-target invertebrate fauna. Mammals cannot metabolize completely endectocides, excreting them in their faeces. Our objective was evaluate the ecological functions performed by native dung beetles (faeces removal and soil bioturbation), their functional guilds in Cerrado's pastures and the effects of ivermectin on these insects. We sampled native and introduced pastures. We measured the ecological functions: nutrient cycling (amount of cow faeces removed) and the bioturbation (excavated soil) performed by dung beetles delimiting a 1m-diametre circumference in each pasture system using cow feaces ivermectin-free (control) and containing ivermectin 1%. We used pitfalls traps baited with cow faeces ivermectin-free and cow feaces-treated to collect dung beetles community. We collected 1572 dung beetles of 29 species. The dominant functional guild was the tunnelers, representing more than 50% of our samples (mostly from the genus *Dichotomius*). Dung beetles richness and abundance were lower in ivermectin-treated than on ivermectin-free cattle faeces. These results represent the lower attractiveness of ivermectin-treated faeces on dung beetles. However, there was no direct effect of ivermectin use on ecological function but we detected an indirect negative effect of ivermectin use through dung beetle activity: ivermectin use broke down the positive correlation of faeces removal with dung beetle abundance and species richness. We hypothesize that few species able to use those contaminated faeces, probably the *Dichotomius* tunnelers, that still remove and excavate soil but activity reduction was due to beetle intoxication. We concluded that ivermectin reduces ecological functions through the reduction of faeces attractiveness for dung beetle community.

S08.P.11

THE IMPORTANCE OF TREE MAINTENANCE IN PASTURES FOR BIRD CONSERVATION AT BODOQUENA MOUNTAINS, BRAZIL

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Bird abundance and species richness have been found to vary according to changes in vegetation structure among habitats. Therefore, the density of trees maintained in cultivated pastures may affect bird occurrences, and finally the function of pastures as permeable habitats linking natural reserves. In this study we address the hypothesis that abundance and richness of bird species typical of forested habitats increase as density of trees remaining in pastures increases. The study was conducted in the Cerrado domain, Bonito county, southwestern Brazil. The abundance and richness of birds were sampled by point counts throughout nine months on 70 sites, at least 200 m apart. Sample sites were randomly distributed in the pastures of the region, and sampled at random. To assess tree densities we counted tree individuals (DBH $\geq$ 10 cm) in four 4x4 m plots in each sample site. In the study pastures we recorded 771 individuals of 66 species of birds. Number of records per site ranged from 0 to 34 (11 $\pm$ 7.15; n = 70), and number of species from 2 to 21 (6.3 $\pm$ 4; n = 70). In total, we counted 360 trees inside plots. Density of trees per site ranged from 0 to 0.29 trees/m^2 (0.07 $\pm$ 0.07; n = 70). The richness of birds increased with the increasing of tree density in the pastures (r^2 = 0.14; p = 0.002), such as the abundance of individuals (r^2 = 0.05; p = 0.04). Overall results support that increased tree density can increase the abundance and richness of bird species which are able to use pastures as stepping stones among remaining natural areas, or even as part of their living habitats. Thus the maintenance and increasing of trees in the pastures should be considered for bird conservation in the Bodoquena region.

S08.P.12

Floral resource availability and its use by hummingbirds in the Cerrado of Central Brazil.

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Although hummingbirds are considered to be an important group of pollinators, few studies about their ecology are available for some ecosystems. The Cerrado biome harbors one of the world richest vascular flora, but at a given community, the proportion of ornithophilous flowers is relatively low. Maybe due to this trend, hummingbird visits are frequently recorded in non-ornithophilous flowers of Cerrado and these opportunistic visits may be crucial for their maintenance. We quantified the floral resource availability for hummingbirds in two sites of cerrado, sampling three plant physiognomies: cerrado, campo sujo (grassland with scattered shrubs) and forest. We recorded the assemblage of plants visited by the hummingbirds, the temporal and spatial dynamics of nectar and with these data sought for the factors affecting the frequency of hummingbird visits to the plants. Floral resource availability varied considerably during the year, in synchrony with the flowering of the most abundant species but without clear association with the seasonality typical of the Cerrado. The amount of nectar available per plant individual and the amount of nectar available in the entire area were the factors affecting the frequency of the hummingbird visits (multiple linear regression $r^2=0.850$; $F_{2,6}=17.05$; $p=0.003$). Flowers presumably adapted to hummingbird pollination, however, were not more visited than others ($t_7=0.171$; $p=0.076$). In most of the non-ornithophilous plants, hummingbirds seemed to act as nectar thieves, since there was no morphological match between visitor and flower. Nevertheless, in some species (especially large flowers and “brush” flowers) the hummingbirds may act as complementary pollinators. Even though the effects of hummingbird visits for non-ornithophilous plants are yet to be clearly defined, for the bird perspective this opportunistic use of flowers is certainly important, especially in the Cerrado where hummingbird-pollinated plant diversity is relatively low.

S08.P.13

Ixodids associated to small mammals in a forest fragment of the Cerrado biome, southeastern Brazil

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Small mammals are hosts for larvae and nymphs of ticks, which are vectors for many pathogens. Therefore, these associations highly impacts animal and human health. In areas of the Cerrado biome, there is little information on occurrence of immature ticks on these hosts. This study aimed to identify Ixodids associated with small rodents and marsupials trapped in a forest physiognomy of Cerrado, in the rural area of Uberlândia, Minas Gerais state, Brazil (S 18° 57.024' W 48° 12.372'). Ticks were collected from small mammals captured monthly from June 2011 to March 2012, and the identification was based on morphological characters. The prevalence (P) and mean intensity (MI) of the total captured animals (n=602) were 7.8% and 2.0, respectively. The ticks found were *Ixodes* sp. (23 larvae and 32 nymphs), *I. loricatus* (12 adults), *Amblyomma* sp. (17 larvae), *A. dubitatum* (9 nymphs) and *A. cajennense* (one adult not attached to the animal). The host species were *Rhipidomys* sp. (n=296; P=2.0%; IM=1.33), *Mus musculus* (n=6; P=33.0%; IM=3), *Gracilinanus agilis* (n=95; P=13.7%; IM=2.54), *Didelphis albiventris* (n=26; P=30.8%; IM=2.25), *Hylaeamys megacephalus* (n=61; P=14.7%; IM=1.2) e *Oligoryzomys* sp. (n=83; P=10.8%; IM=2.0). All specimens of *Oecomys* sp. (n=35) were not infested. These findings corroborate the literature and reinforce the importance of the association between immature *Ixodes* sp. in Sigmodontinae and adults of *I. loricatus* in marsupials. In addition, this study presents the first record of nymphs of *A. dubitatum* in Sigmodontinae.

S08.P.14

Floristic and dispersion syndrome in a cerrado sensu stricto 22 years after different treatments of deforestation

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The floristic composition and dispersal syndrome were assessed in cerrado *sensu stricto* woody vegetation (savanna woodland), located at the Fazenda Água Limpa in the Federal District, Brazil. The randomized block experiment was set up in 1988, including eighteen 20 x 50 m plots subjected to six treatments of deforestation: T1) Logging with chainsaw and removal of firewood, T2) Logging with chainsaw, removal of firewood and fire, T3) Deforestation with blade and removal of firewood, T4) Deforestation with blade, removal of firewood and fire, T5) Deforestation with blade, removal of firewood and double harrowing, T6) Logging with chainsaw, removal of firewood, fire, removal of stump and double harrowing. In 2011, 22 years after application of treatments, all woody plants with Db ≥ 5 cm established in the plots were classified according to the floristic composition (family, genus and species) and dispersal syndrome (anemocoric, autochoric and zoochoric). Observed a total of 31 families, 51 genera and 68 species, where, respectively, 21, 27 and 34 were common to all six treatments. The treatments 2 and 4 showed the greatest number of species (52), followed by T1 (51), T3 (51), T6 (50) and T5 (49). The dispersion prevalent in all treatments was zoochoric ranging 54-60% of species, where T1 had the highest percentage. The anemochory had its highest percentage in T2, with 44% and autochoric did not exceed 2% in each treatment. The woody flora of the cerrado *sensu stricto* is currently in process of establishment. About 22 years after deforestation, 50% of the species were not observed in all treatments and the animals are mainly responsible for the dispersion of species.

S08.P.15

Direct Seeding of Cerrado Tree Species: Testing Nurse Plants and Fertilization

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Direct seeding is a promising method to ecological restoration because it is cheap, can be mechanized, allows seedling establishment in favorable microsites by using high seed density, and its high initial seedling density mimics naturally regenerating sites. The disadvantages are prolonged weed competition and high susceptibility to desiccation. The Brazilian savanna ecosystem, named Cerrado, is known by low seedling establishment, because of seed limitation and frequent fires. Thus, testing direct seeding and fire prevention would be worthwhile. With the aim of improving direct seeding methods, we tested the effects of nurse plants and fertilization on the survival and growth of 11 native tree species. All combinations of the two factors (i) fertilization (chemical, organic and no fertilization) and (ii) nurse plants (crop plants - maize and cassava; green manure - Pigeon pea *Cajanus cajan* and Castor oil plant *Ricinus communis*; and no nurse plants) were tested in a farm in the Federal District of Brazil. Emergence and survival after 15 months were highly variable among species, but were not affected by nurse plants and were negatively, although weakly, affected by organic fertilization. *Eugenia dysenterica* had 55% of seedling survival from the total sowed seeds, *Hymenaea stigonocarpa* had 44%, *Magonia pubescens* had 43%, *Anacardium occidentale* had 27%, *Aspidosperma sp.* had 19%, *Dipteryx alata* had 15%. *Acrocomia aculeata*, *Eriotheca pubescens*, *Terminalia argentea*, *Tabebuia aurea* and *Solanum lycocarpum* had less than 7%. Nurse plants had no effect on seedling emergence and survival, but decreased seedling growth, mainly when compared to the fertilized high-biomass nurse plants. Apparently, direct seeding has great economic and ecological potential for restoration in the Cerrado, but more experiments are needed to ensure proper recommendations.

S08.P.16

Aclimatization of *Cyrtopodium* cf. *palmifrons* Rchb. F. & Warm (Orchidaceae) in different substrates

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The Acuri, *Attalea phalerata* Mart. ex Spreg. (Arecaceae) is a native palm plentiful at Bioma Cerrado and serves as host for many orchids' species, such as the *Cyrtopodium* cf *palmifrons* (Orchidaceae). In order to evaluate the development of this orchid on different substrates were set up four treatments with four repetitions, each one with six plants obtained from germinated seeds *in vitro*. Plantmax® and Acuri (1:1); Acuri; Plantmax® and Coconut Fiber (1:1) and Coconut Fiber were used as substrates, and Acuri substrate resulted by triturating of their leafs bases. After 150 days was assessed the roots number, root and shoot length, root ramification and root and shoot dry weight. The shoot plants cultivated at Plantmax® and Acuri substrate obtained the greater length (20 cm) and greater average of dry weight (306 mg), however the roots number average (7.7 cm) accused no statistical difference from the treatment with Plantmax® and Coconut Fiber (7.9 cm). The average number of roots ramification in treatment containing Plantmax® and Acuri (20.3) was greater than the treatments with Acuri (14.2) and Coconut Fiber (3.3), but there was no difference from the Plantmax® and Coconut Fiber (18.4). The roots length was similar between the treatments. Despite the good development of the roots in Plantmax® and Coconut Fiber substrate, the roots dry weight (139mg) was inferior to treatment with Plantmax® e Acuri (215mg) and did not differ from Acuri substrate (186mg). These results demonstrated that Plantmax® and Acuri substrate provide a better growth and development of roots and shoot, resulting in more hardy plants than in other substrates. The plants cultivated on Plantmax® and Coconut Fiber had a similar development such as plants cultivated at Acuri, showing the native palm has provided appropriated substrate to *C*. cf *palmifrons*. The Coconut Fiber didn't shown good results for this specie.

S08.P.17

Economic Value of the Biodiversity Storage Service Provided by Brazilian Quartz Mountain Ecosystems

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The Brazilian rupestrian field ecosystems provide various goods and services to society and support a significant amount of biological diversity. Notably the rich plant biodiversity has high levels of endemism and a variety of uses among the local communities and general society. Although these unique Brazilian high altitude ecosystems constitute an important ecological refuge and are source of useful services to society, they are subjected to significant anthropogenic pressures manifested in intense habitat fragmentation. In this context, the goal of this study is to perform the first economic valuation of the rupestrian field ecosystems to provide subsidies for the development of public policies of conservation and encourage sustainable practices in these vanishing ecosystems. Given the intense human disturbances and pressure and unique flora, the Serra do Cipó (southern portion of the Espinhaço Mountains in southeast Brazil) was selected for the study. We estimate the monetary value related to the plant biodiversity storage service provided by the study area. The calculation was performed using the maintenance costs of native plants in the living collections of a botanical garden. The acquisition and maintenance costs for a plant specimen under ex situ conditions were approximately US$129.66. The plant biodiversity storage value provided by Serra do Cipó ecosystems is significant, averaging US$29.79 million/year and ranging between US$23.65 million and US$35.93 million. Considering the estimated area of species occurrence, the average value of the plant biodiversity storage service of the study area is US$942.39/ha/year. The economic value of the services provided by Serra do Cipó ecosystems is certainly substantially higher given that the value of other ecosystem services has yet to be investigated. This study contributes to the development of new approaches and perspectives related to the conservation of these Brazilian quartz mountain ecosystems as well as other speciose and threatened ecosystems in tropics.

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S08.P.18

The effect of land-use change in Brazilian savanna: comparing ant community structure between natural habitats and agro-systems

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The greatest threats to biodiversity conservation are habitat loss and fragmentation caused by land-use changes (e.g. agricultural activities). Furthermore, agricultural practices can affect insect diversity through changes in habitat structure, which affect resource availability and induce landscape homogeneity. However, and in spite of the important roles played by ants in ecosystems, little is known about how the transformation of natural habitats into agro-systems may affect ant community structure. Here, we provided comparative information about ant assemblages in reserves with natural vegetation (savanna and forest habitats) and adjacent monocultures (crop fields), in Southeastern Brazil. Ants were collected above and below ground in six different sites, using conventional and modified pitfall traps. Globally and for each site, species richness was significantly smaller in monocultures than in reserves. In monocultures, the ant community was composed of a subset of all species collected in the reserves. However, differences in species composition were more marked between forests and monocultures than between savannas and monocultures. Savanna-associated species were less affected by the conversion of natural habitats into monocultures than forest-associated species, indicating that the magnitude of the land-use change effects on native ant communities is species specific. Species well-adapted to open areas, e.g. *Pheidole oxyops* and *Dorymyrmex* spp., were favored by the environmental conditions in monocultures. Despite the changes in ant community structure between reserves and monocultures, the diversity partitioning patterns appeared similar. In both habitats, the contribution of between-site species turnover to overall (gamma) diversity was greater than the contribution of within-site species turnover. These results suggest that the conversion of natural habitats into monocultures affect the structure of native ant communities by causing a decrease in species richness and compositional changes through faunal homogenization. In addition, spatial heterogeneity appears to be important for maintaining ant diversity even in disturbed environments.

S08.P.19

ARSENIC EFFECTS ON BACCHARIS DRACUNCULIFOLIA (ASTERACEAE): PERFORMANCE, TOXICITY, ACCUMULATION AND NUTRITIONAL QUALITY

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One of the environmental aggravating left worldwide by the use of pesticides, herbicides and gold exploration is the toxic residues of arsenic that remains in many tropical regions where its concentrations may reach 20.000 $mg.kg^{-1}$. The use of widespread plant species for remediation of this element has been deeply investigated. In Brazil, *Baccharis dracunculifolia* presents a wide distribution and can be found in soils with elevated arsenic concentration. Therefore, we tested if this plant species has a fitoremediator potential. Thereby, the development, accumulation capacity and distribution at six different concentrations (5, 10, 25, 50, 100 e 200 mg.kg-1*As*) of arsenic in this plant were evaluated. Laboratory experiments showed that there was an increase in total biomass of plants up to 10mg.kg-1*As* while at higher AS concentration biomass decreased. *B. dracunculifolia* showed some sensitivity to arsenic, indicated by increased shoot length and thickness, while leaf number and root thickness decreased. At 100 and 200mg.kg-1*As* concentrations, plant leaves showed the classical toxicity symptoms such as chlorosis and necrosis The distribution of *As* in *B. dracunculifolia* increased logarithmically with increasing concentration of arsenic in the soil (y = 37,418ln(x) - 35,213). The arsenic was distributed in all plant parts, but the accumulation was higher in the roots and only small amounts were translocated to the stem and leaves. FT was less than 1 and FBA was greater than 1 in all treatments. The content of macronutrients and micronutrients in leaves, stems and roots of *B. dracunculifolia* were modified by the presence of *As*. The results showed that the studied species cannot be characterized as fitoextractor of As. Othwerwise, an interesting trait observed is the accumulation of As in the root system what may present an important trait as it is prevented to pass to other trophic levels. Acknowledgments to Fapemig and CNPq.

S09.OC.01

Analyzing the boundaries between Nearctic and Neotropical floras: biogeographical insights from the tropical dry forest of southern Mexico

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In this presentation we analyze the probable biogeographical origin of the flora of the tropical dry forest (TDF) of Mexico, and its implications, from a historical-biogeographical perspective. The geographical location of Mexico on the North American tectonic plate should naturally imply that its biota is part of the Nearctic Realm, yet its tropical flora has been repeatedly classified as Neotropical. The climatic tropical dry region of Mexico is by no means homogeneous as several distinct vegetation types occur in it, even within the same landscape. Also, some plant communities of the typically Nearctic arid and semi-arid regions share numerous floristic elements with TDFs. These considerations cast some doubts on the biogeographical affinities of the tropical dry vegetation of Mexico. In this study we performed a phytogeographical analysis for several plant communities found in a region considered a biogeographical node, namely the Isthmus of Tehuantepec. We found differences in the floristic affinities of these plant communities, which can be explained based on climatic and other ecological factors rather than on historical factors. Additionally, we conducted a review of the history of the flora and the vegetation heterogeneity of the Mexican seasonally dry tropics as a whole. The origin of the flora of the Mexican TDF can be traced back as far as 20 Ma b.p., and seems to be associated with the North American flora of the Tertiary. The available evidence does not provide support to the treatment of the TDF flora as having primarily a Gondwanic origin. Similarly, the biogeographical separation of the TDF from the hot North American deserts as part of two different biogeographical realms is not warranted. The history of the seasonally dry tropical flora of Mexico strongly suggests that this biogeographic dichotomy should be replaced by the recognition of the existence of a Pan-American realm.

S09.OC.02

Natural and manipulated succession in a Mexican dry forest: recovering functional biodiversity

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We evaluated richness and density of trees and animals, seed dispersal and herbivory in 11 50 X 50 m plots in a dry tropical forest in Mexico under manipulated succession (fenced, enriched with 18 native tree species planted in August 2006), natural succession (fenced controls) and perturbed areas (not fenced). By 2011, birds (insectivores, frugivorous, nectarivorous and raptorial) and bats (nectarivorous and frugivorous) duplicated their density, whereas seed eaters birds triplicate it, irrespective of treatment. Already more seeds dispersed by animals than by wind were recorded in the seed rain within plantings by 2010. In 2011, plant richness of individuals > 20 cm in height was similar under natural and manipulated succession but richness was higher under natural succession than in perturbed areas. Richness of terrestrial ants duplicated with time irrespective of treatment whereas ant density increased the first year and decreased the following years; however in 2006, generalist myrmicine and hot climate specialists dominated, but currently, tropical climate specialists are dominant. *Pogonomyrmex barbatus* (Formicidae) transported higher diversity of seeds within the fenced plots, although seed biomass transported within fenced plots was 3.2 times lower probably because higher vegetation cover. In fact, smaller ant nests with less workers disappeared during the rainy season of 2011. Average rodent density triplicate by 2010, being higher under natural than in manipulated succession since 2008, particularly for the seed eater rodent *Liomys irroratus*. The rodent *Sigmodon hispidus* usually associated to pastures, was not found in 2011 within fenced plots. Herbivory was 5 times higher in early-succesional than in late-successional tree species. However, the late-succesional *Swietenia humilis* (Meliaceae) showed the opposite trend. Richness and density of plants and animals have increased with time in fenced plots irrespective of treatment; however, seed dispersal by animals and density of some fauna was favored under manipulated succession.

S09.OC.03

Fragmentation impacts on reproduction, pollination and genetic diversity in tropical forest's trees

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Forest destruction and fragmentation represent major threats to tropical dry forest (TDF) around the world. Forest fragmentation is predicted to disrupt pollination and sexual reproduction of tropical plants because most species are animal pollinated, obligate outcrossing and self-incompatible. Consequently, it is of scientific and conservation interest to determine the effects of fragmentation on pollination, reproduction, matting patterns and genetic variation of tropical plants in remnant stands. We show general patterns of the consequences of forest fragmentation on plant pollination, reproductive dynamics and genetic parameters of tropical plants. Because the limited number of studies the information presented is clearly biased by trees. The available data allow us to predict vulnerability patterns to forest fragmentation based on ecological and reproductive traits of plants. Obligate outcrossing species will be particularly vulnerable to disruption of pollination caused by fragmentation particularly dioecious species that are pollinated by small insects with restricted flying movement. Analyses of genetic diversity suggest that fragmentation is shifting mating patterns towards increased self pollination. Moreover, recent analysis show a consistent reduction in the number of pollen donors involved in pollination and less genetic diversity in progeny from remnant forest fragments. Results suggest that the most proximate cause of reproductive impairment in fragmented habitats may be pollination limitation. We discuss the implications of these findings for conservation and the role of remnant stands preserving reproduction and genetic variation.

S09.OC.04

The potential for the maintenance of native biological diversity in agricultural systems of a seasonally dry tropical region of Mexico

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The massive land use/land cover changes that have taken place in tropical regions for decades raise doubts about the potential of anthropogenic agrosystems to maintain the immense biological diversity of the tropics in the future. Information gathered in some localities suggests that some degree of human disturbance may enhance local and regional species richness; however, this is not a universal response. More importantly, species richness *per se* tells little about the quality of the species being maintained. Thus more research is needed in tropical dry regions on the effect of increasing human activities on their biodiversity over longer time spans. In this contribution we address this issue by collating data from various studies conducted at a single dry-tropical locality (Nizanda, Oaxaca, Mexico). Until recently, in this region low-tech farming activities were practiced, which contrasts with present increasing trends in land use intensity for cash crops and cattle raising. Nonetheless, the region still maintains numerous patches of secondary vegetation in different stages of successional development, together with large tracts of original vegetation (mainly tropical dry forests). Our studies indicate that successional vegetation provides usable habitats for an important fraction of the regional avifauna, with fallows of intermediate and old age attracting more bird species than very young ones. Conversely, both the analysis of the floristic composition in younger fallows, and of seed bank contents in secondary stands and crop fields reveal the almost total absence of mature forest plant species in these agrosystems. This absence is surprising given the apparently unlimited propagule dispersal in this region (mostly by wind) and the supply of propagules from the mature forest. Overall, our results suggest that anthropogenic activities in this region could cause a substantial floristic impoverishment in the long term, both in terms of sheer species numbers and their identities.

S09.OC.05

Arthropod communities, vegetation structure and seasonality in a Mexican Tropical Dry Forest

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Various taxa of arthropods are sensitive to changes in the composition and structure of vegetation, and thus they can be useful to assess the impact of land degradation on biodiversity, and to monitor ecosystem recovery during restoration. This led us to study arthropod communities in a recently excluded area (~97 ha) from cattle grazing in NW Morelos, Mexico, where a restoration program is taking place. Five plastic bowls with soapy water were placed (24 h per month during a year) in two sites at each of the following vegetation types: a) grassland, b) *Quercus* forest (QF) and, c) tropical deciduous forests (TDF). A total of 309 morphospecies and 1813 individuals, from 17 orders and one class were recorded. The orders having higher species richness were Hymenoptera, Diptera, Coleoptera, Araneae and Homoptera. Hymenoptera and Homoptera registered highest abundance and species richness during the dry season, while the opposite pattern was found in Diptera and Coleoptera. Diversity indices and equitability were highest in the TDF and lowest in the grassland. Ants were more abundant in the grassland, while species richness and abundance of Diptera were higher in both forests types compared to the grassland; Coleoptera and Araneae were more diverse and abundant in TDF patches. Many species were common to the three vegetation types, but nine were associated to QF, 19 to TDF and 11 to grassland. Therefore, they could be used to monitor changes during forest restoration. Cluster analyses showed a large effect of seasonality, and a minor effect of vegetation type, in grouping communities from the six study plots. Thus, we conclude that the effect of seasonality is stronger than the effect of vegetation when small-scale changes in the composition and abundance of arthropod communities are being studied.

S09.OC.06

Plant communities in a forest-savanna complex of north-central Nigeria, a comparison with dry deciduous forests of central India.

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Here we examine the patterns in diversity, species abundance, and size-class distribution of woody plants in a forest-savanna complex in the Plateau state, North-Central Nigeria. We sampled 20 plots (each of 100 m^2) in three widely recognized plants communities: gallery, savanna, and rocky outcrops. However, the DCA ordination of all the pooled plots delineated a pattern in species assembly that categorized the plots in slightly different groups: rocky outcrops, forest thickets, and savanna vegetation. Thickets are closed canopy forest islands surrounded by savanna and or rocky outcrops and are dominated by evergreen trees and shrubs in the understorey. Species richness and diversity of woody plants > 2.5 cm diameter at breast height was greatest in forest thickets and lowest in savanna. Tree basal area was highest in rocky outcrops (4.58 m^2 ha^{-1}) followed by savanna (3.98 m^2 ha^{-1}) and forest thickets (3.18 m^2 ha^{-1}). Of the 61 woody species found in the plots, *Syzygium guineense* was the most common species, and occurred in all plots except the plots on rocky outcrops. Of all the plant families, Rubiaceae had the greatest representation (nine taxa) followed by Fabaceae (seven taxa).

In comparison, the subtropical dry forests of India forests of similar physiognomy and stature are less diverse at a community and plot level. Among five most abundant species, Indian dry forests share two tree genera (*Anogeissus* and *Terminalia*) with the Nigerian dry forest-savanna complex. We hypothesize that Indian dry forests are subsets of tropical dry forest-savanna complex of Africa, with truly fire-adapted components such as family Proteaceae missing altogether from Indian dry forests.

S09.OC.07

Tree floristic, structure and functional groups variations in relation to successional stages and soil properties in a tropical dry forests of southeastern Brazil

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The Tropical Dry Forests (TDFs) are considered one of the most threatened ecosystems in the world and one of the less known, especially regarding the *regenerating process* after disturbance. This study aimed to characterize floristic and structural variations and functional groups of the arboreal component in relation to different successional stages and edaphic characteristics in a TDF in the Mata Seca State Park, northern Minas Gerais, Brazil. For this purpose, 18 plots of 20 m × 50 m were allocated in different successional stages (early, intermediate and late), where all tree-shrub individuals with DBH (diameter at the breast heigh) ≥ 5 cm were sampled, and the classics quantitative parameters were calculated. The functional groups were defined between the dispersion, regeneration and stratification guilds, the $\chi 2$ (chi-square) test was used to verify the independence of functional groups. For the analysis of chemical and physical soil properties, samples from each plot were collected, and tested the soil influences in floristic composition by using Canonical Correspondence Analysis. We sampled 1712 individuals, belonging to 89 species and 24 families, in which 35 species were found in the early stage, 46 in the intermediate and 55 in the late. The basal area increased in relation to the succession chronosequence (early = 4.01 m^2ha^{-1}; intermediate = 9.50 m^2ha^{-1}; late = 15.88 m^2ha^{-1}). The individuals frequency distribution in functional groups depended on the succession stages, except for dispersal guild, that presented greater number of anemochorous individuals in all stages. There was a strong relationship between some soil variables (pH, Mehlich phosphorus, remnant phosphorus, aluminium saturation, organic matter and base saturation) and the species distribution. These results showed striking differences among successional stages, in vegetation structure, and distribution of functional groups. These differences are important indicators for the strategies definition of use and conservation of TDFs.

Support: Tropi-Dry, IAI, CNPq, FAPEMIG, CAPES, IEF e UNIMONTES

S09.OC.08

Floristic composition and structure of a tropical dry forest at different successional stages in the Espinhaço Mountains, southeastern Brazil

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The floristic composition and structure at intermediate and late succesional stages from a tropical dry forest (TDF) on limestone outcrops in the the Espinhaço Mountains, southeastern Brazil were evaluated. In each fragment, three plots of 20×50m were delimited, totaling 0.3ha for each successional stage. In each plot, all trees with a diameter at breast height (DBH) >5cm were sampled and identified. Standard phytosociological parameters were calculated and compared between stages. The most representative families at the two successional stages were Fabaceae, Apocynaceae and Malvaceae, but species composition differed between intermediate and late stages: species with highest importance value in the former were *Myracrodruon urundeuva*, *Rauwolfia sellowii* and *Inga platyptera*, whereas *Anadenanthera colubrina*, *Myracrodruon urundeuva* and *Bauhinia brevipes* predominated in the latter. The main parameters measured varied with the successional stage. In the intermediate stage, the structural parameters were: basal area 17.8m2·h-1, density 1076 individuals/ha, average height 6.30m, species richness 23, while community indexes were Shannon-Winner biodiversity 1.51 and Pielou evenness 0.48. For the late succession stage, the structural parameters were: basal area 29.3m2·h-1, density 1226 individuals/ha, average height 7.7m and species richness 38; community indexes were Shannon-Winner's diversity 2.38 and Pielou's evenness 0.64 Due to the marked geographical isolation, this TDF has a unique floristic composition. Results indicated important changes in floristic composition and structure between the two succession stages. In spite of their wide geographical distribution, the knowledge on seasonally dry forests on lime stones is scanty and urgently needed due to ever increasing human disturbances.
The study was supported by FAPEMIG and CNPq.

S09.OC.09

Spatio-temporal dynamics of insects in a Brazilian Tropical Dry Forest

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In tropical ecosystems, environmental seasonality, resource quality and availability and succession have been reported as important factors driving the diversity and structure of animal communities. However, little is known about the influence of these mechanisms on insect spatial-temporal dynamics in tropical dry forest (TDF). Insects are major players on the dynamics of forest ecosystems in the tropics and have major impact in the process of natural succession. The main goal of this study is to fill a gap in the knowledge about insect diversity in Brazilian TDFs. We tested several hypotheses related to insect spatial-temporal dynamics, assessing the effects of secondary ecological succession, environmental seasonality, vertical stratification, and structure of habitat in insect communities. The study was conducted in the Mata Seca State Park, Manga (MG), Brazil. The effects of environmental seasonality and secondary succession on different feeding guilds were studied, and highlighted that some taxa are more sensitive to such variations, presenting changes in community structure. We detected seasonal and successional changes in the richness, abundance, and composition of herbivorous insects, butterflies, mosquitoes and dung beetles. Ants remained in the environment throughout the year and their richness did not change with the progress of secondary succession. The spatial and temporal alterations on insect community structure alteration are probably determinate by changes in resource availability and climatic conditions. The differential response among feeding guilds is probably related to distinct mobility capacity and foraging patterns. The description of such patterns is fundamental to improve the knowledge on seasonal dynamics in TDFs and important to determine management strategies for the conservation of these ecosystems. After approximately 25-30 years for natural regeneration, the structure of insect communities in intermediate succession stages is similar to late forests.
Support: Tropi-Dry, IAI, CNPq, FAPEMIG and IEF.

S09.OC.10

Regeneration of ecosystem functions during succession in a Brazilian Tropical Dry Forest: comparative importance of plant community composition and leaf traits

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This study aimed to compare leaf functional traits of dominant tree species along a successional gradient in a tropical dry forest (TDF), in order to understand how the ecosystem functions related to these traits regenerate naturally after disturbances. In the Mata Seca State Park, southeastern Brazil, we determined three successional stages (early, intermediate, and late) of a TDF based in land use history and vertical and horizontal forest structure. At each stage, three 50 x 20m plots were established and, based in a floristic survey, the five most representative tree species were determined per plot. For five individuals of each species per plot, the following leaf traits were examined throughout the 2009-2010 rainy season: leaf blade morphology, specific leaf area, polyphenol and chlorophyll content and leaf lifespan. The early successional plots were dominated by leguminous (Fabaceae) species, whereas community composition was more diversified and very similar between intermediate and late stages. In contrast to previous studies on forest succession, no significant differences in leaf lifespan were detected between stages. All the other leaf traits analyzed here varied along the successional gradient: polyphenol content decreased and specific leaf area increased from early to late stages, indicating that leaf sclerophylly is lower in advanced stages, as well as the defensive function related to these traits. Chlorophyll content was lower in the intermediate stage, probably as a consequence of its lower soil nutrient availability. However, plant species from the same successional stage were not grouped together in a Principal Component Analysis based in leaf traits, but phylogenetically related species tended to be associated. Several functional leaf traits differed between the intermediate and late stages despite of their high species similarity, suggesting that the use of plant richness and composition as indicators of ecosystem functions in TDFs should be considered with caution.

S09.OC.11

Alternative Techniques to Restore Cerrado and Dry Forests of Brazil

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Ecological restoration must be grounded on the natural regeneration traits of the targeted ecosystem and on the agricultural practices developed along centuries. Tropical Dry Forest and Cerrado (Brazilian savanna) tree species are recognized by high resprout ability after disturbances such as slash, burn and ploughing (high resistance), and are thought to have low probability of seedling establishment, because of seed limitation and frequent fires (Cerrado), and because of dry season severity (Dry Forests) (low resilience). We tested the resprouting ability in root and large stem stakes, and top soil utilization (bank of roots), as potential methods to propagate and to restore these ecosystems. We also tested direct seeding of Cerrado species, verifying facilitation by crop plants, green manure, and mulch. Root and stem stakes of strong resprouter species had low or absent sprouting; Large stakes of *Myracrodruon urundeuva* had the better results with 23% of rooting in 150 days and 13% after one year. Stakes of *Spondias mombin*, which is not a strong resprouter in deforested areas, but is traditionally known as a good stake, had 83% of success. Top soil utilization of Cerrado is being very successful after 15 months, with 10 plants/m^2 and more than 100 species found in one hectare. Direct seeding experiments in Cerrado are promising for some large seed species, with mulching, and without strong cover by crop or green manure. *Anacardium occidentale*, *Hymenaea stigonocarpa*, *Dipteryx alata* and *Eugenia dysenterica*, all fruits and nuts of high economic value, had high germination and survival rates. Alternative techniques to Cerrado and Dry Forests restoration are promising, but need to be intensely studied. Traditional knowledge and local innovation have much to inform on these cheap and efficient techniques.

S09.OC.12

Challenges of Restoration of Dry Forest Caatinga*

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Caatinga is a vegetational complex of 800.000 km^2, presenting a wide variety of environments and physiognomies. There is predominance of Neosoils, with an average rainfall of between 400 and 800 mm/year, concentrated in three months of the year. The richness is estimated in 4,479 species of plants, 20% of those being endemic, one of the highest registered in Tropical Dry Forests (TDFs). On the other hand, resilience is one of the most fragile in Brazil. The original vegetation was reduced in 81%, of which 22% are desertified. In four years inventorying, rescuing and monitoring the flora, CRAD/UNIVASF diagnosed the main challenges to restore Caatinga: 1 – multidisciplinary knowledge; 2 – unprecedented technological innovation in TDFs; 3 – collection of seeds; 4 – production and management of seedlings; 5 – experiments of restoration in a short period of the year; 6 – income alternatives for the farmers; 7 – high cost of production of seedlings, which is low competitive. The main results were: the collection of seeds of 1,200 geo-referenced trees, which form a germplasm bank constituted by 131 species; a floristic inventory with 184 families, 875 genres and 1,751 species, of which 252 were unprecedented in Caatinga and 61 were invasive species; the coconut fiber, abundant in the area, was efficient in the maintenance of soil humidity, influencing positively the succession dynamics in degraded environment, with low cost and substitution the *Pinus* husk; the production of seedlings in tubes was compromised by the xylopodes in several species; in degraded, isolated areas, monitored for three years, only two species were reported, suggesting that specific disturbances compromise natural regeneration; herbivorous caprines provoked high mortality rates in key species such as *Spondias tuberosa* and *Ziziphus joazeiro*. These studies are important for the establishment of recovery protocols for degraded areas in Caatinga.

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S09.P.01

EVALUATION OF THE SUCCESSIONAL DYNAMICS IN TROPICAL DRY FORESTS OF THE INTER-ANDEAN VALLEY OF THE MAGDALENA RIVER, WITH THE PURPOSE OF SUSTAINABLE MANAGEMENT (COLOMBIA-SOUTH AMERICA)

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Tropical dry forests located in the inter-Andean valleys are probably the most damaged ecosystem of Colombia. Studies of successional processes are important for its conservation and management. This research shows preliminary results about successional dynamics during 3 years in a 0.5 ha plot of secondary tropical dry forest located in the upper part of the Magdalena river valley, in the north of the department of Tolima. We recorded 404 individuals (diameter at breast height, > 5 cm). The exponential mortality coefficient (lm) reached a value of 1.95 % whereas the annual mortality rate was 1.93 %; the mortality of 75 % of these trees was associated to the presence of climber plants in this successional area. The annual recruitment rate was 1.98 %. Based on the diameter growth rate expressed by the organic model of Von Bertalanffy for known asymptote (dD / dt = 0.1412 (D0.7364- 0.297D), the weighted average which reached a value of 1.057 cm/year was determined; therefore, the time required for the forest to reach the asymptote (80 cm) is greater than 400 years. The extremely long time needed to reach the structure of a mature dry forest reveals the urgency to conserve this ecosystem.

S09.P.02

Human disturbance increases Euphorbiaceae populations and leads to high community similarity in Brazilian Caatinga

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Anthropogenic disturbances affect plant populations and communities, changing their structure and dynamic. In response to new conditions, less tolerant species are removed from the habitat, while other may benefit. Euphorbiaceae is one of the most rich plant families in Brazilian Caatinga, and is composed by several colonizing species. Here, we verified how Euphorbiaceae populations respond to anthropogenic disturbance. We hypothesized that Euphorbiaceae species benefit from disturbance and we expect (1) higher abundance, (2) higher rate of proliferation (i.e., higher juveniles/adult ratio) and, consequently, (3) increased vegetation floristic similarity in more disturbed areas. We established 26 plots (30 m × 20 m) in a disturbance gradient in Caatinga areas of the Parnamirim, NE, Brazil. We marked and identified all individuals of the genera *Cnidoscolus*, *Croton* and *Jatropha* and assigned them into juveniles (DSH < 3 cm) or adults (DSH ≥ 3 cm) age classes. We also surveyed all woody community with DSH ≥ 3 cm. We calculated (1) the number of Euphorbiaceae individuals, (2) the total population abundances and (3) juveniles/adult ratios. We also evaluated the influence of relative abundance of Euphorbiaceae species on floristic similarity between plots. We sampled 10,051 individuals. Disturbance influenced the total number of Euphorbiaceae individuals. *Croton sonderianus*, *Cnidocolus quercifolius*, *Cnidoscolus vitifolius* and *Jatropha ribifolia* showed higher abundance in more disturbed areas, while *Croton* sp. showed the opposing pattern. The abundance of *Jatropha molissima*, *Jatropha mutabilis* and *Cnidocolus urens* populations were not affected by disturbance. Only *C. quercifolius* and *J. molissma* showed higher juveniles/adult ratio in more disturbed areas. Our results suggest that anthropogenic disturbances in Caatinga areas can promote the proliferation and persistence of Euphorbiaceae species, resulting in communities with high florist similarity.

S10.OC.01

Long-term Andean uplift controls productivity in Amazonian forests

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Tropical forest biomass and biodiversity are central to international conventions on climate change and biodiversity conservation. The factors controlling biomass and species distributions in Amazonia remain poorly understood, however, as does the role of biodiversity itself in controlling patterns in biomass. Here we use a large dataset from western Amazonia, combined with satellite imagery, to demonstrate that patterns in productivity in Amazonia are inseparable from patterns in plant biodiversity. We further demonstrate that these patterns in composition and productivity are driven by long-term Andean uplift and widespread drainage reconfiguration dating to the Miocene. These findings provide a single causal chain leading from paleogeology, to soils, and to forest composition and function. We argue that paleogeology provides a common framework for understanding compositional and functional patterns in Amazonian forests.

S10.OC.02

Is the Amazon rainforest adequately represented in terrestrial biosphere models?

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Terrestrial biosphere models (TBMs) are widely used to predict the response of global ecosystems to future climate change. TBMs simulate global vegetation using the concept of plant functional types (PFTs) with Amazon rainforests usually represented by one or two PFTs. These PFTs are defined by a set of parameters, with chosen values believed to represent 'typical' values over extensive geographical ranges. In this study, we review the chosen values of key parameters from the most commonly used terrestrial biosphere models and compare these to observations from tropical forests. We focus mainly on parameters that are of direct importance for simulating biomass dynamics, including the residence time of woody biomass and the allocation of net primary productivity to woody biomass. We show that for these parameters, the default values used in the models span the full spectrum of observed values. Observations demonstrate clear differences in the dynamics of western Amazonian forests compared to eastern Amazonian forests which are currently not captured by TBMs. We stress the need to improve understanding of the drivers of these spatial differences in forest dynamics so as to improve the simulation of the carbon cycle of the Amazon forest in TBMs.

S10.OC.03

The impact of drought on carbon dynamics in Western Amazonian forests

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We present the results of a comprehensive synthesis of autotrophic respiration and Net Primary Productivity (NPP) of 8,1 hectare plots in the Western Amazon that experienced significant drought in 2010 and compare these to non drought periods of 2009 and 2011. We show that NPP remained relatively constant through the drought period while there were decreases in autotrophic and heterotrophic respiration. There was also a slight shift in NPP allocation patterns from wood towards roots. We combine autotrophic respiration and NPP for each site to estimate total carbon usage, which decreased during the drought period. Carbon use efficiency appeared to increase during the drought period. Overall, I will present the first detailed full carbon cycle for many Amazonian sites experiencing natural drought.

S10.OC.04

Carbon productivity, allocation and cycling in lowland and montane forests in Amazonia and the Andes

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There have been few studies that present a comprehensive description of the magnitude and allocation of net primary production, autotrophic respiration and gross primary production in tropical forests. Here we present results from a network of studies ranging across the Amazon and Andes region. In three lowland rainforest sites in Brazilian Amazonia, estimates of gross primary production and soil respiration from "bottom-up" studies compare favourably with this from "top-down" studies of gas exchange from flux towers and soil CO2 efflux studies. The carbon use efficiency of old-growth Amazonian forests is around 30%; this seems to increase after disturbance to about 50%. Studies of the allocation of NPP across Amazonia suggest some consistent patterns: NPP increases with soil fertility but the relative allocation above vs. below-ground remains relatively constant. Recovery from disturbance seems to favour disproportionate allocation above-ground, probably because of the enhanced competition for light. New data from an elevation transect in the Peruvian Andes yield further insights into carbon cycling. Both above-and below-ground NPP decline with elevation along our transect in approximately constant proportion. Most heterotrophic respiration processes decline with elevation, probably because of the influence of lower temperatures, but autotrophic processes tend to show much less decline with elevation, suggesting plant acclimation to ambient temperatures. The overall partitioning of NPP between stems, canopy and fine roots is relatively invariant across Amazonian and Andean forests. Leaf litterfall is found to be a good predictor of total NPP in low-disturbance tropical forests, and may provide useful estimates of NPP where comprehensive NPP data are not available.

S10.OC.05

Spatial and Seasonal Variation of Above Ground Net Primary Productivity Along an Elevation Transect, Peruvian Andes.

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Above-ground net primary productivity of tropical forests represent a large fraction of their total carbon allocation, hence an important aspect of the global carbon cycle. The seasonality of canopy and woody net primary productivity could yield important insights on the environmental drivers of the above-ground forest production. Here we report on the spatial and temporal patterns of above-ground carbon dynamics along a tropical forest transect ranging from lowland Amazonia to the high Andes in South East Peru. In particular, we provide a detailed analysis of net primary productivity allocation to canopy components (leaf, twigs, flowers, fruit, bromeliads, epiphytes) along the elevational gradient and determine the effects of seasonal variation on each component. Mean annual above-ground productivity was estimated to vary between 9.50±1.08 Mg C/ha/yr (210 m) and 2.59±0.40 Mg C/ha/yr (2020 m), with consistently lower values observed in the cloud immersion zone of the montane forest. Canopy productivity decreased significantly with increasing elevation from 5.60±0.42 Mg C/ha/yr at 210 m to 1.19±0.05 at 3020 m. Patterns of carbon allocation to canopy components change along the elevational gradient and over the annual cycle, showing evidence of increased allocation to reproductive components during the wet season within the cloud immersion zone. In forests with a more pronounced dry season, the phenology of reproductive organs appeared to vary according to moisture availability.

Keywords

Carbon dynamics; elevational gradient; ecophysiology; light incidence; seasonality; soil water content; temperature; tropical montane forest.

S10.OC.06

Ecosystem exchange of CO_2 and CH_4 between West Amazonian fertile forest and the atmosphere

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For 20 years, the productivity of Amazonian forests has been studied by direct measurements of CO_2 exchange between the forest and the atmosphere, in addition to other biometrical methodologies. An unplanned historical bias towards low-fertility sites has recently being addressed with the installation of a flux tower in the Tambopata region in Peru, a more fertile western Amazonian rainforest site. In addition to CO_2, CH_4 flux is also being continuously monitored to allow a more complete description of the local carbon cycle. Leaf level photosynthesis and respiration and its relationships with foliar nutrients have also been determined for the region allowing link between scales (leaf to ecosystem) to be considered. Contrary to expectations, preliminary analyses indicate that wet season canopy level primary productivity is lower than other Amazonian sites. Leaf level photosynthesis showed a tendency for nitrogen limitation, while foliar phosphorus was a less strong predictor of photosynthetic capacity, a result perhaps consistent with expectation considering the relative high P availability on young Andean-derived soils. Finally, the observed patterns of CH_4 fluxes indicate that this ecosystem is close to neutrality for this chemical species, despite high soil moisture content favoring anoxic conditions. Continuous monitoring will provide valuable information on seasonal variation in fluxes and primary productivity, enabling computations of a new annual carbon balance.

S10.OC.07

High-yield oil palm expansion spares land at the expense of forests in the Peruvian Amazon

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High-yield agriculture potentially reduces pressure on forests by requiring less land to increase production. Using satellite and field data, we assessed the area deforested by industrial-scale high-yield oil palm expansion in the Peruvian Amazon from 2000 to 2010, finding that 72% of new plantations expanded into forested areas. In a focus area in the Ucayali region, we assessed deforestation for high- and smallholder low-yield oil palm plantations. Low-yield plantations accounted for most expansion overall (80%), but only 30% of their expansion involved forest conversion, contrasting with 75% for high-yield expansion. High-yield expansion minimized the total area required to achieve production but counter-intuitively at higher expense to forests than low-yield plantations. The results show that high-yield agriculture is an important but insufficient strategy to reduce pressure on forests. We suggest that high-yield agriculture can be effective in sparing forests only if coupled with incentives for agricultural expansion into already cleared lands.

S10.OC.08

Changing fire regimes in the Peruvian Andes: implications for tropical montane cloud forests dynamics

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Tropical montane cloud forests (TMCFs) in the eastern slope of the Andes harbour exceptionally high levels of biodiversity and contain large carbon stocks, but are also one of the areas most threatened by climate and land-use change. Although TMCFs have traditionally been considered fire-sensitive ecosystems, there is paleoecological evidence of fires in the region up to 12,000 y BP. However, climate and land use changes are having a direct impact on increasing fire frequency and severity in TMCFs that may turn those ecosystems into more fire-dependent plant communities. Here we report on a study examining the effects of forest fires on TMCFs carbon stocks in the different forest compartments (above- and below-ground), forest structure and tree species composition, based on an intensive inventory of paired burnt and unburnt TMCFs in the Andes of south-eastern Peru. Results showed that there were no substantial changes in family diversity, but there were shifts in species diversity, frequency and abundance. Sprouting ability, biomass, wood density and bark thickness showed to be important traits in determining fire tolerance of species and individuals. Substantial changes in carbon stocks were also found, specially by depleting below-ground carbon contents.

S10.OC.09

Effects of different land-uses on soil organic C pools in the Peruvian tropical forests

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Tropical soils are a large carbon reservoir, acting as both a source and a sink of carbon dioxide. Changes to these soil environments have major implications for long term carbon storage and rising atmospheric carbon dioxide concentrations. Enhanced carbon dioxide emissions originate, in large part, from the decomposition and loss of soil organic matter following anthropogenic disturbances such as deforestation or agricultural conversion.

The estimations of global carbon budget from land use change in tropical forests result in major uncertainties, in particular the response of soil carbon stocks to deforestation and land cover change. The main focus of this study is to investigate the soil carbon dynamics on sites with different land uses and fire history in the Peruvian tropical forests. These forests are unique ecosystems that range from high-elevation cloud forest through to lowland Amazon rainforest and are increasingly being threatened by deforestation.

The aims of this project are to quantity and compare soil respiration and decomposition rates over the course of a year on sites with differing land uses. The identification of which soil carbon pools have altered will also be quantified by using a fractionation technique to measure the carbon content of three major carbon pools; the light fraction, occluded light fraction and heavy fraction.

The respiration data is so far showing the pasture site is respiring significantly more than the other lowland sites and the mature forest and disturbed mature forest sites have significantly higher values for total soil carbon than the other lowland sites.

Future research for this project will involve innovative isotope techniques to distinguish between the carbon dioxide released from roots and soil organic matter, providing us with a more accurate estimate of how much carbon dioxide comes from soil organic matter decomposition alone.

S10.OC.10

Dung beetles as indicators of land use change and implications for conservation in the Brazilian Amazon

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The Amazon represents the largest expanse of tropical forest in the world, harbouring an enormous biodiversity, and supporting vital ecosystem services for millions of people. Nonetheless, deforestation and forest degradation continue to post a major threat to the long-term integrity of the system. Studies aiming to understand the impacts of tropical forest changes on patterns of conservation value at both local and landscape scales are very scarce. Here, we used data on dung beetle diversity to investigate changes in conservation value at site and catchment scales, covering a gradient from primary forest through degraded (logging and fire) and secondary forest, and agricultural production areas. Data were collected across two study regions in the Eastern Brazilian Amazon - Santarém and Paragominas - each covering one and two million hectares respectively. Dung beetles were sampled using nine baited pitfall traps along 300 m transects that were distributed in a stratified-random design within 18 independent watersheds (c. 5000 ha) in each region and with catchments distributed across a gradient of deforestation. A total of 379 independent transects were sampled. Species richness and abundance values of the dung beetles decreased along the gradient from forest to agricultural areas, although changes were not linear. There were significant differences between primary and degraded forests. Production areas presented completely distinct communities, dominated by species not found in primary forest. We also highlight how estimates of conservation value can be highly sensitive to decisions about species occupancy and the confidence placed in species that are only recorded occasionally, as previously observed by other studies. Although degraded and secondary forests showed a relatively high conservation value compared to primary forests, they were also strongly influenced by landscape context, with surrounding forest cover and forest degradation history often having a greater impact than differences in local land-use.

S10.OC.11

Allometric models for estimating above-and below-ground biomass in Amazonian forests at São Gabriel da Cachoeira in the upper Rio Negro, Brazil

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Precise estimation of biomass at a regional scale is required for evaluating forest carbon stocks throughout the Amazon. We examined six types of allometric models to identify the best estimator of biomass in primary forests (terra firme) in the northwestern sector of the Brazilian Amazon. We also tested six regression models for estimating tree height. We developed each allometric model using measurements of 101 trees excavated in a primary forest distributed along the upper Rio Negro. A simple power function with stem diameter at breast height D as a single variable was selected as the best model for estimating each biomass component, i.e. above-ground total mass AGW, below-ground total mass BGW, and whole individual mass. Among models developed to estimate tree height H from D, we selected a regression model with a coefficient corresponding to an asymptotic height as the best fit. The D–AGW relationship at our study site differed significantly from models developed previously for other regions of the Amazon. We explain this regional variation in part by regional differences in D–H relationships of sample trees. The D–BGW relationship at our site also differed significantly from that in the central Amazon. However, BGW–AGW relationships were consistent between the upper Rio Negro forest and other forests in the central Amazon, in that the BGW to AGW ratio was constant as 0.136 regardless of
tree size. On the basis of D-based allometry and census data from 23 plots established in the upper Rio Negro region, we estimated a stand-level total biomass (dry mass) of 252.6 Mg ha-1. This estimate is at least 73% lower than the potential stand biomass for the region previously suggested by several meta-analyses.

Keywords: Allometric model, Biomass estimation, Carbon dynamics, Climate change

S10.OC.12

Composition and structure of the herbaceous community in three areas of the Southern Amazon

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Environmental heterogeneity is a determining factor of the structure of biological communities. Thus, understanding the distribution of species along environmental gradients provides assistance to conservation. The goal of this study was to determine the distribution pattern of the herbaceous community in three areas of the Southern Amazon. Sampling was conducted in three modules totaling 39 permanent plots according to the protocol of collection of the Program for Research in Biodiversity. All herbaceous and ground hemiepiphyte subjects above 5 cm were recorded. Multivariate analyses were used to summarize the species composition, multiple regression models were used to determine if environmental variables and disturbance caused by logging influenced the composition of the herbaceous community. We recorded 7.965 individuals representing 70 species. The distance of the water course was the main factor associated with the distribution of the species, interactions between variables showed that canopy openness and sand content also influence the species composition, and there was no effect in the number of trees cut. Species richness increased in areas where canopy cover was higher and it decreases as it becomes more distant from the watercourse. The occurrences of preferred habitats for some species have, in addition to an ecological interest, a practical significance for the conservation and management of these species. Currently, the area of preservation of streams provided by the Forest Code in effect is 30 m for rivers up to 10 m wide. However, this study shows that the range of protection should be extended to at least 100 m wide.

S10.P.01

The sentivity of tropical leaf litter decomposition in Peruvian forest

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We present the results from a litter translocation experiment along a 2800-m elevation gradient in Peruvian tropical forests. The understanding of the environmental factors controlling litter decomposition is important in the description of the carbon and nutrient cycles of tropical ecosystems, and in predicting their response to long-term increases in temperature.
Samples of litter from 15 species were transplanted across all five sites in the study, and decomposition was tracked over 448 days.
Species' type had a large influence on the decomposition rate (*k*), most probably through its influence on leaf quality and morphology. When samples were pooled across species and elevations, soil temperature explained 95% of the variation in the decomposition rate, but no direct relationship was observed with either soil moisture or rainfall. The sensitivity of the decay rate to temperature ( ) varied seven-fold across species, between 0.024 and 0.169 $^{o}C^{-1}$, with a mean value of 0.118 ± 0.009 $^{o}C^{-1}$ (SE). This is equivalent to a temperature sensitivity parameter (Q_{10}) for litter decay of 3.06 ± 0.28, higher than that frequently assumed for heterotrophic processes.
Our results suggest that the warming of approx. 0.9 ºC experienced in the region in recent decades may have increased decomposition and nutrient mineralization rates by c. 10%.

S10.P.02

Floristic composition and diversity of a primary forest in the Eastern Amazon, Pará, Brazil.

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The objective of this study was to characterize the tree community floristic composition and diversity of an area of primary forest in the Eastern Amazon, belonging to the company ORSA Florestal, located in the municipality of Almeirim, Pará, Brazil. The survey was conducted in six transects of 10 × 250 m each, adding to an sampling area of 1.5 ha. All individuals with diameter at breast height greater than or equal to 10 cm were measured and, when it was possible, identified on the spot or collected for later identification by means of consultations with specialists, as well as literature and the IAN Herbarium (EMBRAPA-CPATU). For analysis of diversity indices we calculated Shannon-Weaver diversity (H') and the evenness (J'). We found a high richness and species diversity (H'= 4.29 and J'= 0.89). We found a total of of 765 individuals (510 ind./ha) distributed among 38 families, 86 genera and 124 species; 9 of them are managed by the company. The family with the highest number of species was Fabaceae with 30 species, from which three are managed by the company. The species of greatest density were Pouteria anomala (Pires) T.D. Penn. (19 ind./ha), Protium trifoliolatum Engl. (18 ind./ha) and Rinorea racemosa (Mart.) Kuntze (17 ind./ha). The commercial species Qualea paraensis Ducke had 10 ind./ha. Twenty-nine species had only one individual including the commercial species Dipteryx magnifica Ducke, Goupia glabra Aubl. and Parkia pendula (Willd.) Benth. ex Walp. Therefore we can conclude that the study area has high floristic composition and diversity compared to other studies carried out in this forest type, however, we cannot determine whether or not the area could be managed in the future since the actual stock of commercial species is still low in the area.

S10.P.03

How does nutrient availability influence rates of photosynthesis and leaf respiration in Amazonian tropical forest?

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In tropical forests, although some data exist on how nutrient availability controls photosynthesis (*A*), much less information is available on the influence on leaf respiration (*R*). We conducted field measurements at two contrasting rainforest locations in South America: lowland Peru, near the Andean Mountains, and in French Guiana, to the east of the continent. These locations differ strongly in terms of soil fertility and the availability of nitrogen and phosphorus. At each site, a wide range of species was examined (in total 400 trees belonging to over 200 species) that differed in many plant functional traits. We conducted leaf gas exchange measurements on canopy top leaves using a LiCor 6400, with the leaves subsequently collected for area, weight and nutrient analysis. We used this information to examine differences in the relationships between the rates of *A* and *R*, and to investigate how the relationships differed with soil fertility, both within and between the Peruvian and French Guianan sites. As expected, the results identified strong positive correlations between *A* and *R*, but the slope and intercept of the relationships were not constant between sites differing in fertility. We extend this analysis to examine relationships between leaf gas exchange capacity (respiration and photosynthetic capacity) and nutrient concentration, noting differences in the constraints imposed by leaf nitrogen (N) and phosphorus (P). Our study is amongst the first to investigate how nutrient availability constrains *A* and *R* in tropical trees, across many species and a wide gradient in soil fertility. The observed relationships can be used to inform the modelling ecosystem function across the Amazon.

S10.P.04

Litter as a filter of herbaceous seedlings and sporophytes emergence in central Amazonia

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We conducted a study in Ducke Reserve, Manaus, to test the hypothesis that understorey herb richness and abundance are mediated by litter, manipulating experimentally the amount of litter in the field. We also assessed the relationship between topography and litter depth and frequency of bare-soil patches; and the influence of density of reproductive individuals on the emergence of herbs. Litter depth decreased, and the frequency of bare-soil patches increased with terrain slope in the wet season, but were not related with the soil clay content. Neither was related to the topography in the dry season. Emergence from pteridophytes was four times higher in the litter-exclusion treatment and increased with clay content. Propagules from monocot herbs emerged twice more in the litter exclusion than in litter-addition treatment, and also more in sites with high density of fruiting plants. The results are consistent with the hypothesis that herbs with very small propagules are strongly affected by the physical barrier imposed by litter. Given that litter is shallower in the slopes during the wet season, this creates a pattern of higher pteridophytes density and richness in these areas. Monocots herbs, although also limited by litter, were more highly limited by seed availability, and their distribution patterns are at least in part explained by dispersal limitation. We conclude that litter is an important causal factor behind the herb distribution patterns along topographical gradients.

S11.OC.01

Plant functional traits and the slow-fast continuum along successional gradients of Mexico: Do dry and wet tropical forests show parallel trait continua?

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Succession is community assembly in action, and functional traits are thought to drive changing community composition during succession. We test whether there is a change from 'fast' acquisitive traits early in succession towards 'slow' conservative traits later in succession, and whether forest structure (stand basal area as an indicator of speed of succession and of environmental conditions) is a better predictor of these patterns than time since abandonment. Research was carried out in 17 wet secondary forest sites (0-25yrs) and 16 dry secondary forest sites (5-63 yrs) in Mexico. Functional characteristics of the plant community were described with the 'community-weighted mean'(CWM; average trait value of the overall community), which was calculated based on 12 functional traits and a total of 130 species.

Stand basal area and time since abandonment predicted changes in CWM equally well in both forest types. Traits are more strongly related to succession in dry forest (explaining 8 traits) than in wet forest (explaining 6 traits). Specific leaf area, a 'fast' trait reflecting the efficiency of leaf display decreased, and biotic seed dispersal increased with succession in both dry and wet forest. Leaf tissue density and leaf dry matter content increased during wet forest succession, in line with the hypothesis. Surprisingly, the 'slow' traits leaf tissue density, leaf dry matter content, and wood density decreased during dry forest succession, in contrast to the hypothesis. Probably these conservative 'slow' traits are important in early dry forest succession because they are related to drought resistance.

We conclude that secondary forests change in functional composition along a successional gradient. For some traits, dry and wet forest succession exhibit parallel changes from 'fast' to 'slow' traits. Other traits show contrasting trends along the successional gradients which can be explained by the need for drought resistance in early dry forest succession.

S11.OC.02

Successional convergence in functional traits and species composition of trees in Costa Rican wet forests

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We compared community-weighted mean (CWM) functional traits of trees >10 cm DBH in six secondary forests (10 to 47 years following pasture abandonment) and two old-growth forests. Species composition was monitored annually over 7 (4 plots) or 15 (4 plots) years. Wood specific gravity and six leaf functional traits were measured for species accounting for 80-95% of the basal area of trees in each plot. If environmental filtering drives successional changes in tree species composition, we predicted a shift over time in abundance and basal area from species with traits that enable fast returns on tissue investment early in succession to species with traits that lead to slow economic returns later in succession. Consistent with our predictions, we found a decline in CWM specific leaf area (SLA), and an increase in CWM leaf dry matter content (LDMC), leaf thickness (LT), leaf toughness (LTO), leaf density (LD), and wood specific gravity (WSG), both within and among successional plots over time. We further examined changes in CWM traits for the smaller (DBH below the median) and larger (DBH above the median) proportions of the tree community. The species composition of the smaller trees in the secondary forests showed higher similarity to the old-growth forest species composition than did the larger trees. In general, the smaller trees in each plot had larger leaves with lower SLA, and higher LDMC, LTO, LD, and WSG. These results demonstrate that new tree recruits in secondary forests have traits associated with the slow end of the leaf economics spectrum. We conclude that community assembly of secondary tropical forests is associated with environmental filtering based on leaf and wood traits. Our long-term data clearly show that CWM functional traits of trees in the secondary forest understory are converging with those of old-growth forests in the region.

S11.OC.03

Successional age and light effects on seedling growth in alternative successional sequences in the Central Amazon

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In central Amazonia, land use intensity leads to different rates of succession along alternative successional pathways characterized by initial dominance of *Cecropia* spp or *Vismia* spp. *Cecropia* stands follow the classical succession with fast rates of species turnover while *Vismia* stands exhibit much slower rates of change. Aiming to deeply understand the constraints leading to this alternative successional pathways, we studied seedlings performance under *Vismia* and *Cecropia* chronosequences. Through a controlled experiment we determined the effects of successional age and photosynthetic active radiation (%PAR) on relative growth rates (RGR) of nine species of shade-tolerant tree seedlings in *Cecropia* and *Vismia* dominated successions, varying in age from 1 to 20 years. In every stand we applied two paired treatments to evaluate the role of light in limiting seedlings growth: the original canopy intact and the canopy thinned to 65% of the original basal area. Our results showed that in *Cecropia* stands, RGR and %PAR decreased with increasing successional age, and RGR was limited by light. In contrast, in *Vismia* stands light levels and seedling RGR were independent of successional age, and RGR did not vary with %PAR and was lower than in *Cecropia* stands even under similar light levels. Our study demonstrates that seedlings under *Cecropia* and *Vismia* successions perform differently in response to successional age and light availability. Based on seedlings responses, *Cecropia* successions experience environmental changes through time that facilitate species transitions whereas *Vismia* successions show few changes and maintain a limiting environment to seedling growth. Even 15 years after abandonment, *Vismia*-dominated stands are still extremely non-functional in restoring environmental features essential to further successional development. These results emphasize that secondary forests regenerating after sequential burning events in Central Amazon may require restoration efforts to disrupt the positive feedbacks precluding natural succession.

S11.OC.04

Long-term tree population change in secondary rain forests and the effects of stand and population density, functional diversity and phylogenetic relatedness

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Community phylogenetic and functional ecology predict a switch from abiotic to biotic filtering during secondary forest succession, while population ecology predicts that density-dependent effects on growth, recruitment and mortality are major drivers of change. These approaches combined are potentially powerful for understanding succession - the occurrence and strength of density dependence should vary with stand net phylogenetic relatedness NRI and functional diversity FD - but the necessary long-term data for hypothesis testing are scarce. On infertile soils in wet lowland northeastern Costa Rica, we analysed population change for 34 dicot tree species using >20 years of measurements, trees >=10 cm dbh in eight 1.0 ha permanent sample plots, overall stand age range 1-49 yr. We predicted that tree size inequality (coefficient of variation cv of tree basal area G) and cv of G increments would increase with age until reduced by declining recruitment R and increasing mortality M. Additionally, that values of these metrics should increase with overall stand density, density of conspecifics and NRI, but decrease with stand FD; recruitment should show the opposite trends. Initial hypothesis testing used generalized linear models. Patterns of cv G and G_{inc} were varied but often fitted predictions. As predicted, conspecific initial density and initial stand G were negatively related to recruitment rates R and the former, positively with mortality rates M. Also as predicted, functional dispersion was positively related to R and negatively to M but contrary to predictions, NRI was negatively related to M. Results indicate that density dependent intraspecific competition is a major driver of the initial decades of successional change, but also suggest that the intensity of density dependent effects on growth and demography varies as predicted with FD, but not with NRI.

S11.OC.05

Convergence and divergence in alternative successional pathways in Central Amazonia

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The impact of different land use histories on plant succession in the Amazon Basin is poorly known. Two different land use types, abandonment after clearcuts of mature forest and conversion to pastures following clearcuts, lead to domination by different pioneer species, *Cecropia* species and *Vismia* species, respectively. We measured changes in vegetation structure and composition over 25 years of succession by monitoring woody plants on sites 2-19 years after abandonment annually for 12 years. We found that stem densities exhibited no significant trend during the first 25 years. Basal area in *Cecropia* transects increased quickly in the first decade, outpacing accumulation in *Vismia* transects, but the two had converged in basal area after 25 years. *Vismia* transects were much more variable than *Cecropia* transects in stem density and basal area, reflecting cohort growth and thinning in the *Vismia* succession. Species density increased linearly at a much faster rate in *Cecropia* than *Vismia* transects, creating a large divergence after 25 years. Dominance by *Cecropia* decreases more quickly than dominance by *Vismia*. Whereas *Cecropia* sites decreased dramatically in Sorenson similarity during the first decade of succession, *Vismia* sites remained more similar to each other. This study confirms that succession following primary forest clearings in the Amazon exhibits alternative pathways that correspond to prior land use—clearcuts without further disturbance versus clearcuts converted to pastures. The main divergence in the two successions is the extremely slow accumulation of species and persistence of the dominant species over 25 years in abandoned pastures.

S11.OC.06

Beyond chronosequences: spatio-temporal models of successional vegetation change in three Neotropical forests.

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During succession, fluctuations in population dynamics, driven by demographic stochasticity or abiotic variation, may lead to alternative stable states. The existence of different basins of attraction has been associated with neutral processes, but it may also be related to deterministic processes. For instance, land-use before abandonment, or attributes of the landscape matrix may promote shifts in successional trajectories. This issue has been rarely addressed in secondary tropical forests, as most studies are based on chronosequence methods. Space-for-time substitutions permit an analysis of a much larger time frame than would be otherwise feasible. However, chronosequence results cannot be used to directly measure rates of change in vegetation. These limitations may mislead our knowledge about rates of change during secondary succession. Here, we gathered a unique data set combining temporal and chronosequence data from more than 50 stands in Brazil, Costa Rica and Mexico to evaluate uncertainty and variation in successional trajectories over time. We compared these trajectories across stands within regions with those obtained from null models randomizing either the identity or the age of the stand. Within each region, stem density and species richness showed higher variation than expected under a null model, even when controlling for land-use and for age since abandonment. In contrast, basal area exhibited a more homogeneous pattern in all sites except for Brazil. Despite such variation, chronosequence models do capture a general trend of increase in all attributes but stem density. When these trends were compared across stands within regions, individual trajectories showed significantly different rates of change in stem density, basal area and species richness. Together, our results show that chronosequence models are uncertain. Such uncertainty arose from important variation in successional trajectories, independently of land-use and the landscape matrix. Thus, neutral processes might be important during community reassembly in secondary forests.

S11.OC.07

AMAZONIAN SECONDARY FORESTS RESPOND TO CLIMATIC VARIATION: BIOMASS DYNAMICS

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The study relates biomass dynamics and climatic events in secondary forest chronosequences of Central Amazonia. Trees with DBH ≥ 3 cm were measured annually between 1999 and 2011 in areas with different use histories: 9 transects on areas clearcut and maintained as pasture with prescribed fires until abandonment, and 8 transects on areas clearcut and abandoned without further use. For each transect we determined above ground live biomass (ABGB), annual mortality (MR) and recruitment (RR) rates. Climate data, obtained from a meteorological tower 50 km from the study area, were related to interannual biomass variations (IBV). Four drought events occurred during the study period, and the El Nino of 2009/2010 caused strong local droughts with 7.2 and 20.4 mm rainfall in September and November of 2009, respectively (6 and 14% of the expected average). For clearcut-abandoned areas, IBV was significant only twice: an increase in 1999/2000 (10.4% ±2.9%) following the 1998 El Nino drought and a decrease in 2009/2010 (12.9±7.2%) during an EL Nino drought. On these transects, larger dominant pioneer individuals died disproportionately. Higher rainfall deficit during the dry season caused higher MR ($F_{1,9}$=5.04, R^2=0.36, p=0.05) and lower biomass accumulation ($F_{1,9}$=6.17, R^2=0.41, p=0.03) in the subsequent year for clearcut-abandoned areas. In abandoned pastures, IBV were constant throughout the period, ($p_{G\text{-}G}$ = 0.394, $F_{10,80}$ = 0.815), pointing to a possible higher resilience to droughts. RR was constant through time, being higher only in 1999/2000 on clearcut-abandoned areas. Biomass accumulation rates approached zero during drier years, and in 2009/2010 were only moderately negative (-2.1 ±6.6%). Use history affects floristic composition, with some species more resilient than others, with a differential ability to support extreme climate events. Drought can be an important agent, affecting species turnover and influencing secondary forest succession in the Amazon.

S11.OC.08

Successional changes in ecosystem services in wet and dry tropical forests

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Succession after abandonment of pastures and agricultural fields leads to recovery of forest biodiversity and function. The ecosystem services that are provided by these secondary forests, as well as their tradeoffs, change through succession. We hypothesized that these changes differ between wet and dry forest systems. We synthesize information on changes in ecosystem services along succession in in contrasting climates. Our experimental plots are found in a tropical dry and a tropical wet forest in Mexico, include different successional ages and have been monitored for the last 10 years. Microclimatic conditions changed dramatically, particularly in the dry forests: the cooler microclimates during succession are valuable for cattle ranching. Soil fertility and overall soil quality improved slightly with succession.
We found strong differences in carbon storage and carbon uptake among and within forest types. Wet forests take up much more carbon than dry ones, and within each forest type carbon storage and uptake varies as a result of management history and surrounding matrix. Successional in insect pest regulation were not clear-cut as succession advanced: abundance of lepidopterous larvae increased from pastures to other successional stages, beetle abundance was highest in pastures, but insectivorous bats, amphibians and reptile richness and abundance was highest at intermediate stages Late stages presented higher proportion of the species found in old growth forest. The amount and diversity of non-timber forest products that can potentially be used increased with succession, but forage decreased, and wood increased (in the rain forest only). We conclude that tradeoffs among services change through succession and differ between wet and dry forest. Future studies will assess how the different stakeholders perceive these tradeoffs and what are the associated opportunity costs and decisions at stake. Our integrated studies highlight the importance of secondary succession for maintenance of ecosystem services in tropical forested landscapes

S11.OC.09

Secondary forest succession and community assembly in natural blowdown gaps in the Brazilian and Peruvian Amazon

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It has long been recognized that treefall gaps can play important roles in structuring forest tree species community composition and ecosystem processes. However, many studies have been limited to treefall gaps that occur on permanent forest plots which sample only a limited spatial dimension. Gaps in Amazon forests range from single treefalls, to mid-sized disturbance events of 7-10 trees per cluster, all the way up to large blowdown gaps exceeding 30 ha in size. Our study employed a regional approach to studying tree species community composition in treefall gaps, spanning the full gradient of patch size by employing Landsat chronosequences spanning ~30 year intervals coupled with extensive field investigations. Results demonstrate that tree species composition is strongly dependent on the size of the gap, and that episodic succession-inducing gaps occurring at a frequency of 50-100 years play critical roles in determining community assembly patterns. The probability distribution function (PDF) for treefall gaps followed a power-law distribution, which creates a complex successional age landscape patch mosaic. The disturbance PDF varied regionally, with forest near Iquitos, Peru, experiencing more frequent and larger events that forests near Manaus, Brazil. An individual-based forest simulation model, which includes key ecological and evolutionary processes, is being parameterized with these data and will be used to explore how varying disturbance regimes across the Amazon influence basin wide gradients in tree species diversity.

S11.OC.10

TREES FUNCTIONAL TYPES POTENTIAL FOR ECOLOGICAL RESTORATION IN TROPICAL ANDEAN FORESTS IN COLOMBIA

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The research was carried out in the buffer zone of Los Nevados National Park, Central Cordillera of the Andes in Colombia. Were identified plant functional types (PFT´s) in four permanent monitoring plots of 1 hectare with 12 years of follow up from growth, maximum height, maximum diameter and canopy cover functional traits, which are indicators of the role of species in ecosystem processes of plant succession, nutrient cycling and carbon storage. Trough multivariate analysis were found the following 4 PFT´s, the first group with high capacity for repopulation and growth, a second group with the carbon storage capacity to long term, a third mixed group and a fourth group that may be the most complex of incorporating in restoration for their growth properties. Were analyzed the possible implications of each PFT in the process of ecological restoration, suggesting that each PFT has different potential in the repopulation process according their traits and it must discriminate further taking reproductive traits that allow include these groups in planning processes of ecological restoration in degraded areas.

S11.OC.11

A predictive model of Atlantic rainforest recovery based on plant functional types

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After a century of intense exploitation and almost forest extinction, many efforts have been made to recover the Mata Atlântica biome including rigorous environmental laws, scientific research and ONGs action. Therefore, we studied a chronosequence of 14 areas post-abandonment (6-45 yrs) and three old-growth reference forests in Maquiné, RS, southern limit of Mata Atlântica *strictu senso*. We tested the hypothesis that the plant functional types (PFT) trajectory of early natural regeneration is approaching that observed in old-growth forests. Trees and shrubs of all species ≥ 5 cm DBH were sampled in 100 m^2 plots (300-1200 m^2 per area) and described by morpho-ecological functional traits. We identified 7 traits (leaf area, shade tolerance, wood density, maximum height …) from a list of 30 that optimized the correlation between trait composition and age, used to define 9 PFTs. The final predicted state from the observed trajectory was estimated through Markov chains at approximately 135 years. We found great directionality of the modeled trajectory through randomization tests (stress coefficient of Kruskal (K) $P(K_{null} \leq K) = 0.001$). With 87% of variation explained by the first two axes of principal coordinates analysis (PCoA) described by PFTs, the predicted state of 135 years was both approaching and found nearly halfway to the reference forest. The functional techniques could clarify many of confused results obtained by species composition and can expand the limits of space-for-time substitution techniques. The presence of all PFTs in recovering sites shows that slash-and-burn agriculture may not have as permanent effects on forest function with shifting mosaic steady-state management. This could be, once regulated, a positive relation between humans and maintenance of ecosystem services in tropical forests.

S11.OC.12

Patterns of tree leaf fall along a successional gradient in a tropical dry forest

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This study aimed to test if the leaf dynamic of tree species along three successional stages of a tropical dry forest (TDF) corroborates the predicted in other studies conducted in temperate and tropical wet forests. Sampling was conducted in the Mata Seca State Park, southestern Brazil, where nine plots of 50 x 20 m were delimited, three for each successional stage (early, intermediate and late). In these plots, five tree species (three individuals per specie) were selected based in their highest importance values (IV), and leaf fall was followed for two periods: November/2009 to June/2010 and November/2010 to June/2011. In the beginning of the rainy season (November), ten fully expanded young leaves were randomly marked in each individual in order to determine the leaf lifespan. At each subsequent sampling, the loss of marked leaves and production of new leaves were recorded. In both periods, the production of young leaves was more intense in November, while leaf fall started in December extending until June, presenting a peak in February. Compared to the early stage, the intermediate and late stages did not show significant difference in fall leaf patterns. In the middle of the rainy season of 2009-2010, the production of a second generation of new leaves was observed in March for 20% of the sampled individuals (for all of the three stages). In June, the early stage showed the greatest amount of surviving leaves. At the early and intermediate stages during the rainy season of 2010-2011, new leaves were recorded in March (3%) and April (8% of the sampled individuals). In June, the intermediate stage had the greatest proportion of surviving leaves. Our results suggest that there is a great interannual variation in leaf fall patterns in the studied TDF, due to the erratic precipitation distribution in this region. Also, the production of a second leaf generation in the second half of the rainy season is not commonly described in other TDFs and has implications for forest dynamics. Finally, the absence of successional differences in leaf lifespan contradicts studies conducted in wet forests, thus the regeneration of ecosystems functions may follow different pathways in TDFs.

S11.P.01

Short-term effects of large wind-throws on structure and diversity of trees community in Central Amazon

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Tropical forest disturbances and deterministic processes are important for maintaining biodiversity. Gap formation by tree mortality is especially important as it will change environmental conditions. However, the gap size required to achieve this effect is crucial and single gaps from small tree mortality events do not appear to change the structure and forest composition significantly and persistently. We investigated forest structure and tree species composition along a large gradient of gap sizes (≥5.000 m²). We sampled 3.6 ha of terra firme forest close to Manaus, Brazil. Gaps were opened in 2005 by a large blowdown and identified using Landsat images and spectral mixture analysis (SMA). SMA indicates changings in non-photosynthetic vegetation (ΔNPV), which is highly correlated with tree mortality rates. We installed permanent transects plots with 10 m wide and of variable length. Undisturbed plots from a contiguous area were used as a local control. Forest structure was monitored by DBH measurements (trees with dbh≥10.0 cm). We tagged all trees and took samples for botanical identification. We measured 1.944 stems distributed in 284 species, 142 genus and 49 families. Shannon diversity index was 4.76. NPV values from 2004 to 2005 (ΔNPV) varied from zero (no changes in leaf area coverage) to 0.771 (higher mortality). The ΔNPV's average was 0.242. This index explained 21.7% (n= 126; $p \leq 0.001$) of the stem density variation and 15.9% (n= 126: $p \leq 0.001$) of the biomass variation (regression analyses). Phytosociology analyses demonstrated high index of importance values for light demand species. Five years after the blowdown the disturbed forest still presents low values of stem density (442.66 ± 46.57 stems/ha^{-1}) and basal area (17.65 ± 3.22 m^2/ha^{-1}) (CI= 95%). A key result combining field surveys and remote-sensing is an improved understanding of the importance of landscape-scale processes for tree diversity, community assembly, and ecosystem processes.

S11.P.02

Changes in the herbaceous communities on the landslide of the Casita Volcano, Nicaragua, during early succession

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This study examined the main changes in the herbaceous communities during the first four years of succession in a large landslide on Casita Volcano, Nicaragua, located in a densely populated area that has a tropical dry climate. Our main objective was to determine the major pathways of change in community features, such as richness, biovolume, species composition, and abundances of plant traits and to verify if they varied between the different areas of the landslide based on abiotic heterogeneity and landscape context. Number, percent cover, mean height and traits of herbaceous species, and several abiotic factors related to fertility and geomorphological stability of substrates were sampled in 28 permanent plots. Environmental heterogeneity strongly influenced early successional changes in the herbaceous communities during the four years of the study. Biovolume increased in the unstable and infertile areas and decreased in the stable and fertile areas of the landslide. In most of the zones, species richness decreased significantly because of the expansion of a few dominant species that developed a large cover and excluded other species. Those dominant species were mainly responsible for changes in species composition and included annual forbs, e.g., *Calopogonium mucunoides* and *Stizolobium pruriens*, graminoids that have rhizomes or stolons, e.g., *Hypharrenia rufa*, and perennial nitrogen-fixing forbs, e.g., *Clitoria ternatea*. They might be important in determining future successional patterns on the Casita Volcano landslide.

S11.P.03

Spatial dynamics characteristics of a native population of *Araucaria angustifolia*

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A long-lived pioneer population of *Araucaria angustifolia* was studied during 5 years using a spatially explicit census. *Araucaria angustifolia* is a critically endangered dioecious conifer. There is a lack of studies about its spatial dynamics. Thus, the objective of this study was to access the ecological phenomenon linked to spatial and temporal dynamics of the *Araucaria angustifolia.* This study aimed to answer the following questions: i) is the population (>1.5 m height) increasing or declining in occupation in terms of spatial pattern, density and basal area? (ii) Are new member's mortality negatively or positively dependent on distance of adult trees? Or is there a density dependent effect? (iii) Does the height development of regenerating individuals (height <1.5 m) increase with more canopy openness? A 5.1 ha plot (170 x 300 m) was established, where six inventories were conducted in 2007, 2008, 2009, 2010, 2011, and 2012. Each year every individual in the entire population was marked, mapped and measured (from seedlings to adults). The results demonstrated that the population showed small differences in occupation, indicating neither an increase nor restriction in occupation area. On the other hand, density decreased consistently and the basal area increased. The distant-dependent mortality of regeneration on adults was not significant for most of the tests and was not consistent temporally. However, the density-dependent mortality of new members was temporally consistent. The growth in height of regeneration (height <1.5 m) did not change in function of canopy openness, nevertheless, a small variation of canopy openness was found. The decline in density while maintaining basal area and spatial pattern characterize the behavior of a long-lived pioneer population in forests of advanced successional stages. Moreover, density-dependent processes act on the population increasing the distance between regenerating individuals.

S11.P.04

Recruitment Success of Pioneer Tree Species: Importance of topography and gap micro-sites conditions

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The objective of this study was to assess the effect of topography and micro-site conditions on the recruitment success of pioneer tree species in a 20-year old secondary forest in Central Amazonia, Brazil. Four 1x1-m plots were allocated systematically in the center of 21 10x10-m artificial gaps created in three different topographic positions (plateau, slope and valley). The 84 seedling plots were assigned to four different treatments generated by the combination of two litter treatments (unmanipulated and litter removal), and two soil disturbance treatments (undisturbed and disturbed). Seedling emergence was five-fold higher in litter-free plots than in plots without litter removal. Seedling growth and emergence were significantly higher in valleys, indicating that water avalailibility may be the limiting factor for the recruitment success on the higher parts of relief. There were no effects of topography and litter/soil treatments on seedling mortality. Our findings provide important tools for the recovery of degraded lands in which litter removal coupled with the topsoil mixing enhance seedling emergence from the seed bank.

S12.OC.01

Increasing liana abundance and biomass: potential ramifications for tropical forests

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Over the past decade there has been increasing recognition of the substantial contribution of lianas to tropical forest dynamics, diversity, and ecosystem function. Lianas reduce tree recruitment, growth, reproduction, survival and diversity, and these effects can cascade across trophic levels and alter ecosystem processes. With the increase in the recognition of lianas as a key component of tropical forests comes a 22-fold jump in publications focused on liana ecology over the past 3-decades – much higher than the 2-fold increase in all general ecology publications over a similar period. We calculated liana publication rate using our new, open-access, comprehensive, and searchable liana database located at the *Liana Ecology Project* website: www.LianaEcologyProject.com, and we calculated all general ecology publications using the 72 journals in JSTOR from 1900 until 2005. One of the major findings to emerge from these new studies is that liana abundance, biomass, and productivity have increased substantially in neotropical forests. There are now 11 studies documenting striking increases in lianas relative to trees over the past 30 years – a phenomenon that has serious implications for the future of tropical forests. In this introduction to the symposium "Understanding the Increase in Lianas in Neotropical Forests", I highlight the recent discoveries on the role of lianas in tropical forest processes, the evidence for liana increases, the ramifications of increasing lianas to forest productivity and management, and discuss new frontiers in liana research.

S12.OC.02

Liana abundance and tree crown re-infestation 10-years after liana cutting in the semideciduous Atlantic Forest: was there opportunity for tree regeneration?

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Lianas are key components of tropical and subtropical forests as they are able to affect tree growth, survival and diversity, ultimately enhancing gap formation as a consequence of severe liana load and driving forest dynamics into a loop of increasing disturbance. In this study we examined (1) if liana abundance, basal area and tree infestation increased from 2000 to 2010 in northern Argentina , (2) if liana and bamboo cutting decreased liana richness and abundance, (3) if liana re-infested host trees 10 years after cutting, and finally (4) if liana removal treatment increased tree regeneration. To assess these questions we measured liana and tree sapling abundance, richness and basal area, and quantified tree and sapling infestation in a 10-year old experiment consisting of 3 control and 3 liana cutting plots. According to our results, basal area and abundance of lianas are increasing in Northern Argentina as observed in other forests around the world. Tree infestation was enhanced as a result of facilitation (i.e., the presence of lianas climbing a tree favor new arriving lianas), increased tree size and aging. Liana shedding was observed for some individuals at the time others became infested, but three of six focal tree species studied were not able to dump lianas or were rapidly re-colonized. The length of the main stem affected the re-colonization process of host trees in treated plots (i.e, trees with short trunks, besides being unable of shedding lianas, were quickly re-colonized). Liana species richness and abundance of tree saplings was not affected by the removal treatment. Overall, our results are indicating a rapid recovery of liana biomass after 10 years of treatment.

S12.OC.03

Tropical lianas and trees under elevated CO_2: Seasonal drought results in differing growth and physiological responses

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Widespread changes in tropical forests, possibly the result of anthropogenic global change, have been observed over recent decades. The documented increase in lianas (woody vines) in tropical forests is one such change, and a cause for concern. Lianas are associated with an increased risk of tree mortality and may alter forest species composition by disproportionately colonizing non-pioneer tree species. Moreover, lianas have more efficient water transport systems and may have deeper roots, thus are capable of extending growth in the forest canopy during periods of seasonal drought when many tropical trees are photosynthetically less active, deciduous, or otherwise water-stressed. One leading hypothesis for increasing lianas is elevated atmospheric carbon dioxide. We tested this hypothesis by measuring the growth and physiological response of 8 species of tropical lianas and trees grown under elevated and ambient CO_2 during both the wet and dry season.

Preliminary results suggest that during the wet season lianas respond with a larger change in stem height and diameter than trees to elevated CO_2 concentrations relative to ambient concentrations. Lianas also respond with higher rates of photosynthesis and stomatal conductance. However, the first two months of the dry season show mixed results: elevated CO_2 leads to greater relative growth in liana diameter and leaf productivity than trees, but trees exhibit more relative growth in stem height. The average liana and tree responses are each driven by a subset of species rather than a uniform response within growth form. This is the first study to assess whether the combination of increasing CO_2 and seasonal drought is a viable explanation for the observed increase in liana size and abundance in the tropics.

S12.OC.04

Liana competition effects on tropical tree species

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Increasing evidence suggests that lianas significantly influence carbon, nutrient, and soil water dynamics in tropical forests by altering available soil moisture, nutrients, and canopy light exposition, reducing total above-ground biomass by limiting tree growth and survival. We performed a large-scale liana removal experiment in the Gigante peninsula (Barro Colorado National Monument, Panama) to assess liana-mediated competition effects on canopy tree species in a seasonal tropical forest, focusing on above-ground carbon pools and fluxes. Seven tree species from liana-removed and control plots were monitored for physiological performance (continuous measurements of sap flow, and predawn and midday water potential), annual growth, and soil moisture during the dry and wet season, before and after liana removal.
Lianas reduced tree growth and tree sap velocity increased immediately upon removing lianas, indicating competition effects of lianas on tree physiological performance. Without liana competition, trees transpired and grew more, thus indicating higher metabolic activity. The lack of wet-season liana effects suggests that competition is more important during the dry season. Three tree species had significantly higher growth rates and sap velocity after liana removal, showing that lianas have a greater effect on some species than others. Short term water use, measured as leaf water potential, did not show significant differences, indicating that liana effects were present during a longer time-scale, possibly reflecting changes in soil water and light availability over the entire growth period. Sap velocity effects were concomitant to growth differences, as trees in liana removal plots significantly increased growth in relation to control trees. The variation in the effects of lianas with tree species growth indicates that lianas have the capacity to determine tree community composition.

S12.OC.05

Effects of Liana Removal on Soil Water Content in a Panamanian Moist Forest

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It is well documented that individual lianas effectively compete with host trees for aboveground resources like light and belowground resources like water. However, it is not known whether these interspecific interactions are also manifest at the ecosystem scale. Here we tested whether lianas affect stand-level soil moisture using a large-scale experiment in a Panamanian moist forest. We established 16 60x60 m plots and all trees and lianas were surveyed. Lianas were removed from half of the plots by cutting them at the base in April, 2011. We collected high-frequency measurements of volumetric soil water content at two depths in the soil (10 cm and 40 cm), one month before liana removal and ever since. We predicted that removing lianas would increase soil moisture in both surface soils 10cm) and deep soil layers (40 cm).

Preliminary analysis of 13 months of data from six plots (three liana removal and three control plots) shows that throughout the year soil moisture was consistently higher deeper in the soil profile compared to surface soil. Among plots in the surface soil, monthly averages of volumetric water content ranged from 0.22 to 0.26 (m^3/m^3) in the dry season and from 0.26 to 0.40 in the wet season. Analysis of variance with month, soil depth, and treatment (liana removal versus no liana removal) all had significant main effects on soil moisture, with no significant interactions. Contrary to our initial hypothesis, average soil moisture was 0.35 (m^3/m^3) in plots with lianas present and significantly reduced to 0.33 (m^3/m^3) in plots with lianas removed. Because many ecosystem processes like soil respiration and community dynamics such as seedling recruitment are affected by soil moisture, lianas may be influencing many more aspects of the ecology of tropical forests in addition to competition with trees.

S12.OC.06

The role of abundance in liana-tree nested networks

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The interaction between lianas and trees is characterized as antagonistic, since lianas may both decrease tree growth rate and fruit production and increase tree mortality rate. Liana and tree interaction can be represented by ecological networks, a framework commonly employed in mutualism, parasitism and predation studies. The use of ecological networks reveals some important insights into liana-tree interactions. For example, the interaction pattern between both growth-forms is highly nested, i.e., there is a core of interactions among generalist species in which lianas and trees are densely connected. Specialist tree and liana species tend to interact with generalist species. We attested that this pattern remains the same regardless the vegetation structure at the study sites. Previous studies using different types of interaction have shown that nestedness may be related to species diversity. We created matrices of presence-absence based on the relative abundance of species to perform null models. These models indicated that nestedness was hugely associated with the abundance of liana and tree species. However, abundance alone did not explain this pattern of liana-tree interaction. Actually, abundance-based networks were more nested than the real ones, a pattern also found in mutualistic networks. Additionally, trees have traits, such as spines, palm architecture, fast growth, height and exfoliating bark, that influence liana occupation. For example, larger trees are more prone to liana infestation, because light availability is higher in their canopies than in the canopies of smaller trees. Lianas, too, have some traits that can influence the number of trees they are able to climb. For instance, the larger lianas can climb more trees than the thinner ones. The use of statistical modeling shows that these traits, when associated to abundance, explain the real nestedness value more satisfactorily than either abundance or traits alone.

S12.OC.07

The regeneration of lianas and vines from seed on Barro Colorado Island, Panama

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Climbing plants are prominent elements of young secondary forests, forest edges, and forest gaps throughout the Tropics. Climbers also tend to have large specific leaf areas, nitrogen concentrations and photosynthetic potentials and reduced leaf defenses relative to trees. All of this suggests that the regeneration of many climbers is likely to be linked to the high light environments of recent tree fall gaps in old-growth forests. We evaluated this prediction for the climbers of Barro Colorado Island. We followed >9,000 seedlings in 50 newly formed tree fall gaps and >27,000 seedlings in the shaded understory for seven years. A significant habitat (understory versus gaps) by life form (climbers versus free-standers) interaction, with climbers performing disproportionately well in gaps, would provide evidence for the prediction. The interaction was significant for height growth, with climbers growing rapidly in height in gaps. The interaction was insignificant for leaf growth, recruitment and survival, which were all very similar in both habitats for climbers and free-standing species. We also compared leaf traits between the sun-exposed canopy and deeply shaded understory for adults and conspecific juveniles. Surprisingly, leaf plasticity tended to be greater for trees than for climbers.

Our results suggest that climbers and free-standing species are drawn from similar distributions of regeneration requirements and life history variation in the old-growth forest of Barro Colorado. There are climbers whose seedlings are as shade tolerant as any tree seedling. If this result proves to be general, it suggests a reconsideration of the role of climbers in tropical forests. The prominence of climbers in young secondary forests and forest edges as well as the increasing importance of climbers observed in old-growth forests in recent decades might all reflect changes in the species composition of climbers rather than inherent differences between climbing versus free-standing life forms.

S12.OC.08

Contrasting Chemical Traits in Tropical Lianas and Trees: Implications for Future Forest Composition

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Lianas are an important growthform in tropical forests, and recent studies suggest that liana abundance and biomass may be increasing in some regions. Explanations for liana proliferation hinge upon physiological responses to changing resource conditions that would favor them over trees. Testing a potential chemical basis for such responses, we assessed 22 foliar traits supporting light capture, growth, structure, defense, maintenance and metabolism in 7274 canopy lianas (774) and trees (6496) at 33 tropical forest sites. Chemicals promoting light capture-growth and maintenance-metabolism averaged 14.5% and 16.7% higher concentration in lianas than in trees globally. Investment in structure and defense traits was 9.0% lower in lianas. These growthform-specific leaf differences occurred on both a mass and area basis. Liana and tree differences in allocation patterns were strongly mediated by climate, with peak differential allocation by lianas to light capture-growth at about 2500 mm yr^{-1} and 23 ^{o}C. The pro-growth, anti-defense strategy suggests that liana expansion will be largest in forests with moderate precipitation and higher solar irradiance.

S12.OC.09

The geographic distribution of locally dominant liana species in Amazonian forests

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Knowledge of dominance among neotropical lianas is limited to a handful of sites where lianas are identified to species. We predicted that the dominant lianas from three sites would have broad geographic ranges across lowland neotropical forest. Local dominance should predict broad regional distribution. Using the list of dominants from three completely sampled sites in Yasuní [Ecuador], Madre de Dios [Peru], and Amazonas [Brazil], we have compiled the complete geographic distribution of these dominant lianas from Mexico to southern Brazil using herbarium and monographic data.

All lianas were censused in low disturbance forests, with samples including individuals ≥1cm in diameter rooted within 0.5ha plots. Dominance was determined based on stem number, although our results are the same for basal area-based dominance ranking. The 10 dominant liana species from each site (2-12 plots) generated our list of Amazonian dominants, which we acknowledge represent an estimate of the true dominants. For each dominant species, we created a map of its neotropical distribution and measured the extent.

Dominant species were often shared among the three sites. These dominants were often the most widespread geographically, and deserve special attention because they are the most likely to be found at yet more sites. Some lianas species, although present at more than one site were only dominant at a single site, still displaying a large geographic range. Most intriguing were species with a small geographic ranges but playing a dominant role at one site: representing as much as 10% of all stems at that one site.

We conclude that liana species with locally high abundance vary substantially in geographic range, however dominance is not randomly determined at the local scale. Specific morphological traits recur among the dominant lianas, an indication that deterministic processes are in effect.

S12.OC.10

Biomechanics and developmental diversity: two keys to climbing plant success

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The mechanical organisation of climbing plants is pivotal to their ecology, evolution and functional biology and shows profound contrasts with that of self-supporting plants. Most climbing plants drastically modify their stem mechanics during their developmental trajectory, which facilitates three phases of their life history: (1) search for supports (stiffness), (2) attachment to the host plant and (3) maintenance of flexibility and toughness of the mature stem. These developmental changes involve radical changes in mechanical and hydraulic properties via changes in tissue density, ultrastructure and cell wall biochemistry. They occur in a dazzling range of climbing forms and in diverse clades of angiosperms, pteridophytes and gymnosperms.

Extreme shifts in developmental trajectory provide the basis for profound plasticity of growth form in both ecological and evolutionary contexts, and this may represent one of the underlying reasons why climbing growth forms can survive and even increase in ecological importance following perturbation events and during periods of environmental change. However, the goal of understanding exactly what developmental traits provide this advantage is a daunting task since so many kinds of climbing plant exist: from huge, clonal networks of woody lianas adapted to rainforest tree fall gaps to light-structured invasive vines that can obliterate a field of sugar cane in a matter of days. However, what this diversity of climbing plants does generally involve are: (a) specialized mechanical strategies combining extreme stem length, reduced stem diameter, (b) complex changes in stem mechanics and hydraulics, and (c) an astonishing range of attachment mechanisms.

We provide an overview of vine and liana biomechanics in which we highlight some of the key biophysical aspects underlying how these plants develop stiffness, then flexibility and toughness as well as the biophysical novelties behind the huge diversity of attachment mechanisms and self-repair.

S12.OC.11

Seasonality of Secondary Growth of Tropical Lianas

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It is well known that the secondary growth of tropical tree species responds to periodic floods or dry seasons. However, very little is known about the growth of lianas in response to environmental cues. Therefore, the purpose of this study is to understand the general patterns of cambial activity of lianas in response to seasonal rainfall. Accordingly, we studied the formation and differentiation of secondary tissues of four species that represent important liana families in the neotropics: *Dalbergia frutescens* (Leguminosae), *Mascagnia sepium* (Malpighiaceae), *Stizophyllum riparium* and *Tynanthus cognatus* (Bignoniaceae). The study was conducted in São Paulo, Brazil, in a semi-deciduous forest with a well-marked dry season. All species presented growth rings in their xylem, and all presented earlywood and/or latewood anatomical markers. As the earlywood marker, *D. frutescens*, *T. cognatus* and *S. riparium* presented initial parenchyma band, and as the latewood marker, all four species presented fibrous zone and/or radially flattened fibers. Both *D. frutescens* and *T. cognatus* presented yet semi-ring porosity. Nevertheless, the time and intensity of cambial activity differed among the species. *Tynanthus cognatus* presented very intense cambial activity within a short two-month period toward the end of the wet season. On the other hand, the other three species showed weak cambial activity for approximately six months between the peaks of the wet and the dry seasons, but slightly more intense activity in the middle of this period, also toward the end of the wet season. During the rest of the year, the cambium was dormant for all species. Therefore, we can conclude that the studied lianas adopted two distinct secondary growth strategies in face of the seasonal climatic changes.

S12.OC.12

Dendrochronology of lianas of the Leguminosae family from the Atlantic Forest, Brazil

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Information about plant growth, development and age forms the basis for understanding complex forest
ecological processes. Although lianas play an important role in tropical forests, little is known about their growth and development from either climatic or ecological perspectives. Therefore, we studied the growth rings in Legume liana species collected in a mountainous Atlantic Forest in southeastern Brazil. Four of the eight studied species did not show cambial variants, three had a lobed stem, and one had a furrowed xylem. Distinct growth rings were observed in all species. Semi-ring porosity, marginal parenchyma, fibrous zone and radially flattened latewood cells were the main characteristic features of these growth rings. Species without cambial variants, including *Dalbergia frutescens*, *Piptadenia adiantoides*, *P. micracantha* and *Senegalia tenuifolia*, showed very distinct growth rings visible in macroscopic and microscopic analysis. Ring-width time series and cambial wound assessment were performed to analyze periodicity and dendrochronology. The species with cambial variants, *S. grandistipula*, *S. lacerans*, *S. martiusiana* and *S. pedicellata*, also showed distinct growth rings, however, sometimes barely detectable or not detected at all. Cambial wounding, cross-dating and climate-growth relationships indicated the annual nature of growth rings in species without cambial variant. Crossdating between radii within one individual and between individuals was successful, and the synchronized series enabled us to build species chronologies and a mean chronology. Climate-growth analysis revealed significant correlations between chronologies and precipitation, indicating that available moisture is the main factor determining growth rates of lianas in the Atlantic forest.

S12.P.01

Climber diversity and the forest expansion over *campos* grasslands: a nestedness analysis

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In the southern Brazilian highlands, the *Araucaria* forest expansion over the *campos* grassland occurs by edge expansion and - mostly - by nucleation. The factors involved in this ecological process are poorly known from the perspective of climber plants. We observed the pattern of species, functional and phylogenetic diversity of climbers in forest patches of different sizes and in a continuous forest, aiming to check for nestedness. We hypothesized that diversity is related positively to patch size and that community assembly is done mostly by accumulation of species. We studied a grassland area surrounded by *Araucaria* forest in the northeast plateau of the state of Rio Grande do Sul, southern Brazil. We surveyed species abundance inside 5 x 5 m plots in two forest sites, 10 big- and small-sized forest patches and 10 isolated trees. We recorded data on species composition, functional traits and phylogenetic relatedness. For each site, species diversity was calculated through Simpson's diversity index and functional (climbing modes and dispersal syndromes) and phylogenetic diversity through RAO's entropy. We tested for nestedness using the NODF metrics. Species and phylogenetic diversity increased towards the forest. Functional diversity had a similar pattern, but leveled off at big-sized patches. Nestedness was not associated to distance but to patch category size, in which isolated trees were a subset of patches, which by their turn were a subset of the forest. Thus, patch size appears to be the driver of nestedness in species composition rather than proximity to the source area (forest). This indicates that there is not a dispersal limitation for climbers and, once individuals reach the forest patches, the site area will determine if they will succeed in maintaining there. This may be caused by an increment of edge area when patch size increases, providing more suitable supports for climbing.

S12.P.02

Multiple evolutions of the furrowed xylem cambial variant in the Angiosperms

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Furrowed xylem is the name given to a cambial variant characterized by the differential activity of sectors of an initially normal cambium that starts to produce less xylem and more phloem, resulting in the formation of phloem wedges projecting from within the xylem. Although this specific cambial variant is generally directly connected to lianas of the Bignoniaceae, it is actually present in lianas of at least 8 other families within the Angiosperms, namely the Asteraceae, Celastraceae, Convolvulaceae, Icacinaceae, Fabaceae, Malpighiaceae, Passifloraceae, and Polemoniaceae, all of them with an extremely similar final anatomy. Here we collected lianoid members of all these families and studied the ontogeny of the secondary growth and phloem wedges formation in these plants. Overall, what we can see is that all of them start the cambial variant with a continuous cambium, sometimes forming already rather pronounced phloem wedges, but without cambium dissection. Only in the Bignoniaceae and Icacinaceae there is a further step, with cambial dissection and consequent inclusion within the phloem wedges. The loss of radial anticlinal divisions by the variant cambia is thought to be the responsible for cambial dissection and inclusion in Bignoniaceae, something that may also apply to the Icacinaceae. Here we further discuss the impact of this cambial variant for the growth of lianas, conduction of sap, overall anatomical features and evolution within the Angiosperms.

S12.P.03

A Census of climbers in Atlantic Forest of southeastern Brazil

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Aim The community structure of climbing plants was analyzed in the Alto da Serra de Paranapiacaba Biological Reserve (ASPRB) and Nascentes de Paranapiacaba Municipal Natural Park (NPMNP).
Location Two protected areas within the largest Atlantic Forest remnant, Santo André, Southeastern Brazil.
Methods Climbing plants ≥ 1 cm diameter at 130 cm from the point of rooting were sampled in 52 plots of 10 x 20 m (1.04 ha). From these data we calculated the Shannon-Wiener diversity index, abundance and importance value for families, performed a principal coordinate analysis, and created a similarity dendrogram (TWINSPAN).
Results The composition and abundance of species between ASPRB and NPMNP differed significantly with 34 species at ASPRB and 72 at NPMNP, with only 24 species in common. We ascribe this difference to the immaturity of the forest after human disturbance at ASPRB. The two areas formed two groups corresponding to two distinct floristic sets in PCA and TWINSPAN analyses. Montane forests (750-1.174 m asl) are characterized by the predominance of Asteraceae.
Main conclusions The highest species richness, floristic composition, and spatial distribution demonstrate a higher degree of conservation in the area of NPMNP. The high density of climbers found in more conserved areas of rainforest may be related to seasonal low impact of disturbance, forest structure, or factors not included in this study.

S12.P.04

The effect of wound on the stem and cambial variant of Mascagnia sepium (Malpighiaceae)

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Lianas are plants that cannot support themselves in a considerable height, usually reaching the top of the forest by using other plants as support for climbing. Lianas share some unique characters in their secondary vascular system, and the presence of some kind of cambial variant is widespread among families with lianoid species. Lianas have a great capacity of regeneration after injuries, and it is believed that the cambial variants have a critical role on the healing of the stem, yet there is little understanding on how the cambium reacts after an injury. Here, stems of Mascagnia sepium (Malpighiaceae), a species with furrowed xylem, were analyzed using traditional methods in plant anatomy, both from specimens that suffered injuries and healthy stems. Healthy stems of Mascagnia sepium presents the cambial variant 'furrowed xylem', which results from the irregular activity of the cambium, producing more phloem and less xylem in some areas than in others, creating a secondary vascular system with furrowed xylem and phloem wedges. On the other hand, the injured stem presented not only furrowed xylem, but also another of cambial variant, not registered before for this species. Indeed, an asymmetrical structure was found in a young stem, with one side with a regular cambium, in a stage before the implantation of the variant cambium, and the sidewith the injury with the variant cambium producing phloem wedges and three successive cambia, and a great proliferation of parenchyma cells. The injury induced a response from the cambium, that started a differential activity, and that response could be seen for about 20 centimeters in the length of the stem. This study shows for the first time the formation of new cambial variants as a response to injury.

S12.P.05

Cambial variations in the roots of Sapindaceae: a case study in *Serjania caracasana*

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Information about root anatomy in lianas species are scarce, although many times they are important in order to better understand the physiology, taxonomy, phylogeny and ecology of these plants. Many lianas show unusual stem anatomies, generated by a different cambial activity, and many types can be found in Sapindaceae, more specifically in tribe Paullinieae, where most liana species are located. This distinct activity from the cambium leads to the formation of four different patterns in the stems: divided, compound, corded and fissured vascular cylinders. It is unknown, however, if the roots of these lianas show cambial variations, and if present, if they would be from the same type as the stem. Therefore, we studied the root anatomy of a liana from Paullinieae, *Serjania caracasana* (Jacq.) Willd., whose compound stem is composed of a central and eight peripheral vascular cylinders. Root samples with different diameters were collected and treated according to usual methods in plant anatomy. Our results show that the root present cambial variation, but different from the compound type typical to the stem. In young roots, the secondary growth is regular, with a regular cambial activity, creating a normal structure. However, in older roots, new cambia appear, originated from the transdifferentiation of parenchyma cells from the non-conducting secondary phloem, promoting neoformations of secondary vascular strands that are concentrically arranged around the vascular cylinder. These structures are similar to the ones found in older stems, where new vascular strands arise around the central and peripheral cylinders. We can conclude that the roots of *Serjania caracasana* have a normal growth, until cells from the nonconducting secondary phloem generate new cambia. More studies with the same and other lianas from Paullinieae will help elucidating how new vascular strands are connected to the old vascular system, likely promoting a higher conducting area.

S12.P.06

Comparison of the anatomical pattern of the stem in the lianescent, arboreal and shrubby habits in the Bignoniaceae

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Plant communities are generally constituted of species of different habits: lianas, trees, shrubs and herbs. Virtually all plant families possess different habits among their members, something that has also an impact on their anatomical configurations. Hence, the structural formation of each habit will confer characteristics such as resistance to growing towards the canopy, flexibility, torsion, conduction and regeneration. Lianas, differently from the majority of other plants usually possess wider sieve tubes and vessels, a higher amount of parenchyma, a lower amount of fibers, and cambial variants. The present work aims to carry a comparative analysis of stems from species with different habits: lianoid, arboreal, and shrubby, all belonging to the Bignoniaceae. Within Bignoniaceae, the lianas and more rarely shrubs, are well represented in tribe Bignonieae, being also present in tribe Tecomeae (*sensu* Gentry), along with trees. Eleven species with different habits were collected from two tribes of the family: Bignonieae and Tecomeae. The anatomical procedures followed the traditional methods used in plant anatomy, consisting of transverse, radial and tangential sections encompassing the periderm, secondary phloem, cambium and secondary xylem. Here we saw that in average, lianas presented three times wider vessel diameters and conducting area than trees and shrubs, while trees and shrubs presented the double the quantity of fibers. Lianas have wide vessels associated with narrow ones, wider sieve tubes and conspicuous cambial variants. Axial parenchyma in trees and shrubs is aliform confluent and marginal, while in vines it is vasicentric or in initial marginal bands formed. Nonlignified parenchyma is also present in several liana species. Overall, trees, shrubs and lianas present directly correlations with their habits, trees and shrubs responding to the mechanical demand of support and lianas to more efficient sap conduction, flexibility to climb, and injury repair.

S12.P.07

Mapping Oligarchic Lianas in Amazonia (MOLA): Geographically Significant Biodiversity.

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Lianas comprise ~25% of the biodiversity of woody plants in the Amazon Basin. While their contribution to biomass is small, they play a large role in community dynamics, photosynthesis, and plant composition across the tropics. However, the geographic distribution and density are known for very few species of lianas. The dominant liana species is known for only a small handful of sites. We are identifying the dominant species at multiple sites across Amazonia where dominants are now unknown. Our data will be linked to established tree plots to compare tree and liana diversity, dominance, and homogeneity among sites. Liana dominants are scored for a suite of important morphological, anatomical, and physiological characters that are relevant in gaining dominance. Across sites, we predict that dominants will share specific important traits that can be tested using greehouse and common garden experiments.

S12.P.08

Quantifying lianas contribution and coverage to the canopy of a seasonal tropical forest in Panamá

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Lianas play and important role in the ecological dynamics of tropical forests. Experimental and observational experiments have demonstrated that lianas compete intensely with trees for resources, reducing tree growth, fecundity and survival. Much of the competition between lianas and trees is presumably for light; however, the amount of light that lianas intercept has never been experimentally determined. We experimentally quantified the amount of light intercepted by lianas using 16 80 x 80 m plots in a ~60 year-old secondary forest in Panamá. In March 2011 we measured leaf area index (LAI) uniformly in 49 locations replicated twice for a total of 98 measurements in each of 16 plots. We then cut all lianas in eight of the plots in April 2011 (the remaining eight plots were controls). We measured LAI again six weeks and one-year following the liana cutting. Six weeks following liana cutting mean plot LAI was 15% higher in the liana removal plots but did not change in the control plots. One-year following liana cutting LAI was 25% higher in the liana removal plots and 5% higher in the control plots; the higher LAI in the control plots was likely due to more tree leaf loss during the stronger 2012 dry season. Our results demonstrate that lianas contribute around 20% to LAI and canopy structure in this tropical forest. Because lianas tend to deploy their leaves on top of those of their host trees, our results indicate that lianas compete intensely with trees for light.

S12.P.09

Effect of measurement location on lianas abundance and biomass in a Neotropical savanna

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Lianas (woody vines) are a key component of many forests throughout the world, contributing to abundance, diversity and structure. Methods to census lianas and estimate biomass have been used mainly in tropical forests. The ecology of lianas in the Savanna is still scarce. We evaluated the effect of the measurement locations on the liana abundance and biomass estimation in a Neotropical cerrado-savanna. We measured apparent genets of lianas ≥ 0.5 cm in diameter at 30 cm basal area (D_30) and at 130cm diameter breast height (DBH), rooted in 36 transects (10 x 25 m).We used an allometric biomass equation to estimate the aboveground biomass of live lianas. We applied a regression equation between D_30 and DBH to estimate the basal area under the D_30 method of measurement. We also estimate by generalized linear model a new regression equation (NRE) between D_30 and DBH. The average liana abundance and aboveground biomass estimated across the 36 plots was 32.1 ± 33.49, 35.6 ± 35.3 stems per hectare and 9.461 $MG.ha^{-1}$, 5.935 $MG.ha^{-1,}$) respectively at D_30 and at 130cm DBH. The aboveground biomass estimated by the new regression equation was 3.951 $Mg.ha^{-1}$. Our findings at D_30 measurement showed significantly higher aboveground biomass estimation than at DBH measurement. Liana abundance did not differ significantly between the two methods of measurement. Compared to other sites in the neotropics, lianas are less abundant in the Savanna, but the total biomass is within the range of values estimated. Our results suggest that the protocol for lianas censuses in tropical forests may be implemented in savanna.

S12.P.10

EVOLUTION AND DEVELOPMENT OF TENDRILS: KEY INSIGHTS FOR LIANA DIVERSIFICATION

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Angiosperm leaves have undergone several structural modifications over time, and currently exist in a wide diversity of forms. For example, in the tribe Bignonieae, which includes all Neotropical lianoid Bignoniaceae, leaves are generally 2-3-foliolated, and terminal leaflets are often modified into tendrils. These tendrils present varied morphologies and are thought to have been involved in the diversification of Bignonieae. This study investigated the evolution and development of tendril types in Bignonieae in order to further understand how changes in leaf morphogenesis led to current patterns of variation in tendril morphology. We investigated the ontogeny of leaves from 11 different species of Bignonieae representing 7 different genera and a wide diversity of tendril types. We also used a recently published phylogeny of Bignonieae as the basis to reconstruct the patterns of evolution of tendril types using maximum likelihood and maximum parsimony assumptions. Furthermore, we investigated the patterns of expression of *STM*, *PHAN* and *LFY/FLO*, genes that are known to control leaf development in angiosperms. For this, *in situ* hybridizations were carried out in three Bignonieae species bearing different tendril types: simple, trifid and multifid. Ancestral character state reconstructions of tendril type allied to developmental data suggest that trifid tendrils are ancestral in the tribe, with other tendril types evolving through a series of developmental changes. Furthermore, the interpretation of the ontogenetic data in the light of a robust phylogenetic framework led to specific hypotheses about the evolutionary processes and respective changes in gene regulation that may have led to the current tendril morphology found in Bignonieae.

S12.P.11

Pervasive effects of the native collared peccary (*Pecari tajacu*) on lianas, understory vegetation, leaf litter, and leaf litter arthropods in lowland Central American rain forest

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Collared peccaries (*Pecari tajacu*) are a dominant, but intensively-hunted, Neotropical consumer that have trophic (frugivory, folivory) and non-trophic (trampling, rooting) effects on plants. We tested four predictions consistent with the hypothesis of top-down consumer limitation of plants at six Central American sites with *P. tajacu* densities of 3 to >14/km^2 and within three sets of experimental mammal exclosures: (1) Collared peccaries reduce understory vegetation density and cover, and leaf litter depth, mass, and arthropod abundance; (2) Effect size of mammalian exclosure negatively correlates with peccary density; (3) Vegetation density and cover negatively correlates with peccary density across sites; and (4) Peccaries have stronger short-term effects on lianas than on free-standing plants. Relative to mammal exclosures, peccaries reduced understory vegetation, woody plant, and vine density, and liana cover at La Selva Biological Station (highest peccary density), and vine density at Barro Colorado Island and Gigante Peninsula (intermediate peccary density). Peccaries reduced leaf litter depth and biomass at La Selva, but increased litter arthropod densities. Exclosure effect sizes were largest at La Selva, despite the younger exclosures, higher soil fertility, and presence within the exclosures of small terrestrial consumers including agoutis (*Dasyprocta punctata*). Across six study sites, five vegetation metrics – palm cover, herbaceous plant density, vine density, liana cover, and forest cover – negatively correlated with peccary density, while litter depth increased with peccary density, likely due to seasonal effects. Our research demonstrates that collared peccaries exert strong top-down effects on vegetation at a range of densities, independent of predator limitation. This study adds to the growing literature showing that both decreased and increased primary consumer densities negatively affect plant communities, with cascading consequences for other organisms. In order to preserve plant communities and tropical forest biodiversity, large consumers such as peccaries should be maintained at moderate densities.

S13.OC.01

Phenology and ecological restoration: a review

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Ecological restoration is the process of intentionally assisting the recovery of degraded or destroyed ecosystems, and therefore is a palliative to human disturbances and fragmentation. Phenology, the study of seasonal patterns of naturally occurring events, is often not mentioned in the list of data to acquire on the reference ecosystem.
In order to define the goals towards which an ecological restoration project aims, to monitor progress and to assess success, a reference ecosystem must be chosen and described (also called target ecosystem or reference trajectory). The choice of the reference ecosystem should be based on the range of what is possible, as illustrated by spatial and temporal variation in natural ecosystems, ecological, cultural and historical local information. This reference ecosystem must then be defined as it serves as a model for planning restoration. It is therefore advised to use as many sources of information as possible to describe the reference: ecological descriptions, species lists, data on the physical conditions, aerial and ground-level photographs, paleoecological evidence and historical accounts. Only recent books on ecological restoration acknowledge the need for phenology study to manage weedy plants or collect seeds, but some earlier papers have been written on phenology and ecological restoration. This presentation aims at reviewing the major studies on restoration and phenology and to draw conclusions on its pertinence in the conceptual planning of a restoration project.

S13.OC.02

PHENOLOGY OF HERBACEOUS SPECIES IN SAVANNA AND TAPIA (Uapaca bojeri) WOODLAND ON IBITY MOUNTAIN (MADAGASCAR)

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The highlands of Madagascar have some of the island's most fragmented natural ecosystems. Characterized by a history of occupation and land-use dating back more than 1000 years, highland savannas and rain forests have been replaced by extended areas of rice fields and anthropic grasslands through the extensive use of fire as an agro-pastoral tool. Our research concerns Ibity Mountain, a new protected area situated 200km south of Antananarivo in Madagascar's Highlands. The mosaic of plant communities found today is mainly composed of savannas and to a lesser extent remnant stands of open "Tapia woodlands", dominated by Tapia trees (*Uapaca bojeri*), in association to other woody species of Sarcolaenaceae (the island's largest endemic family) and an herb layer composed mostly of Asteraceae, Lamiaceae, Rubiaceae, Poaceae and Cyperaceae, some of which are shared with the savannas. A 2-year phenology study, initiated in February 2010, was conducted using a set of ten 1m² quadrats in 8 savanna and 6 Tapia woodland understory sites. A comparison between the phenology of the herbaceous elements of these two communities was performed. We looked at the differences between the contribution of flowers/fruit of the principal species for each community, and the differences in this parameter for each species between Years 1 and 2. In both vegetation types, ~80% of the species contributed to our assessment of phenology (~20% never produced flowers/fruit). In the savannas, three Poaceae (*Loudetia simplex*, *Aristida rufenscens* and *Andropogon* sp.) and one Cyperaceae (*Bulbostylis trichobaris*) contributed the most to phenology, whereas in Tapia woodland other species made a much greater contribution including: *Spermacose stricta* and *Odenlandia herbacea* (Rubiaceae), *Helicrysum gymnocephallus* (Asteraceae) and *Panicum pasvifolium* (Poaceae). Phenology patterns in both communities will be discussed with regard to the abiotic factors influencing the life cycles of the principal species.

Keywords: herbaceous communities, fragmentation, phenology patterns, Savanna, Ibity Mountain.

S13.OC.03

Floral Phenology of *Catopsis berteroniana* (Schult & Schult. F.) Mez (Bromeliaceae), a dioic epiphyte in an oak forest of Oaxaca México

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We knew little about vascular epiphyte floral phenology and much less about dioecy epiphyte phenology for which synchrony of reproduction between pistillate and staminate individuals is key to the reproductive success of the species. In order to increase our understanding of epiphyte dioecy phenology we studied the phenology of *Catopsis berteronina* in an oak forest in Oaxaca, Mexico. In February 2006, 115 individuals taller than 10 cm (reproductive size) were labeled in a plot of 20x20 m. On a monthly basis and during a year these individuals were surveyed and data recorded were: presence of reproductive structures, presence of inflorescence, presence of floral buds, presence of flowers and presence of fruit, and seed release. We observed that there was only one reproductive event for both morphs with duration of three months. Only 23 (15 %) labeled individuals produced reproductive structures, 12 (52 %) were pistillates and 11 (48%) staminates. The synchrony index among pistillate individuals was 0.723± 0.209, among staminate individuals 0.954± 0.015, and between pistillate and staminate individuals of 0.833±0.189. We noticed that the flowering season is during the rainy season. In this period the presence of insects increases and according to our observations these organisms are probably flower pollinators and the high synchrony between pistillate and staminate individual allows increased fruit production. Seed dispersal occurs during the dry season when the high speed of the wind and the missing foliage on trees permits a farther dispersal distance of the anemochorous seed of Catopsis.

S13.OC.04

The effects of urban heat islands in the phenology of tropical and temperate trees

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Urban heat island effect (UHI) is the temperature increase caused by the substitution of the natural environment by built up and sealed areas in the cities. Urban phenology is relevant for assessing the effects of heat islands and potential impacts of climate change on plants. We examined whether differences in air temperature and humidity within an urban-rural gradient can influence phenological onset dates of trees in a temperate mid-latitude city (Munich, Germany) and a city in the neotropics (Campinas, Brazil). (Dis)similarities were identified by an equivalent study design incorporating consistent phenological observation methods and meteorological data. We found that phenological onset dates for flowering and leaf unfolding of *Betula pendula* in Munich were correlated to temperatures and suitable to describe the UHI. However, phenological onset dates for *Tabebuia chrysotricha*, *Caesalpinia pluviosa* and *Tipuana tipu* in Campinas had much greater standard deviations of onset dates and the magnitude and significance of correlation coefficients with temperature varied greatly among species and phenophases. Nevertheless, we found statistically significant correlations, especially for flowering and leaf unfolding phenophases of *Tipuana* and air temperature variables, and for leaf unfolding phenophases of *Tabebuia* and humidity variables. We conclude that the phenology of *Tipuana* is sensitive enough to detect urban heat island effects in the tropical city of Campinas and might be a useful indicator of local temperature variations and in turn of global warming. Since *Tipuana* is widely used for urban landscaping in South America, we foresee many applications for monitoring heat island effects in neotropics. Furthermore, the assertion that most phenophases of *Caesalpina* and *Tabebuia* were not responsive to temperature increase stressed the importance of humidity variables to access UHI on tropical cities. (Finnancial support: FAPESP, CAPES and CNPq).

S13.OC.05

Phenological patterns of two contrasting altitudinal herbaceous communities

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In South America, just a small percentage of herbaceous vegetation has been examined from the point of view of their seasonal changes. However, the study of phenological patterns is crucial to understand plant community dynamics and the co-occurence of species, especially in species-rich tropical plant communities. In a harsh and heterogeneous environment, the *campos rupestres* (altitudinal grasslands located on quartzite mountain ranges in southeastern Brazil), we monitored the phenology of the two dominant herbaceous communities, the sandy and the stony grasslands, during two consecutive years. The aim of this study was to test whether the phenological patterns are different between these two nearby communities constrained by soil characteristics. Phenological patterns were similar in both communities. The production of flowers and fruits did not differ with a flower peak occurred at the end of the rainy season and a fruit peak in the dry season. In both communities, Cyperaceae and Xyridaceae were families with the highest species contribution to overall phenology. Cyperaceae flower and fruit production was higher in sandy grasslands than in stony grasslands. Poaceae, the most abundant family in both communities, did not produce a lot of fruits. Although soil properties are different between the sandy and the stony grasslands, our results indicated that rainfall was the main driver of phenological patterns in both communities. Our findings will provide the basis for future conservation and restoration programs and will help to understand climate change impacts on those ecosystems. We thank FAPEMIG, the CNPq, the CNRS and IRSTEA for financial support.

S13.OC.06

The influence of climatic variability on tropical plant phenology: a comparison between Panama and French Guiana

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Changes in the periodicity of the life-cycle events of organisms - i.e. in phenological patterns- due to global warming are becoming evident, which will make phenological studies of great importance while addressing critical questions related with climatic change. Plant phenological patterns in the tropics are both more diverse than in extra-tropical systems and less well understood, despite the relevance of tropical forests both for the earth's carbon budget and for biodiversity conservation. Thanks to long-term monitoring of plant phenology, we could ask whether inter-annual climatic events such El Niño/La Niña influence temporal variability of seed production. We have analyzed two datasets coming from two old-growth forests in the Neotropics: Nouragues in French Guiana (years of sampling: 2001-2011); and Barro Colorado Island (BCI) in Panama (1987-2011). We used a hierarchical Bayesian approach to explain variation in seed production with climate, using a total of 200 species for both sites. Results of the models show that species within both communities showed contrasted patterns in the year-to-year variability for the two studied parameters: peaks of seed production and the moment of the year when peaks were reached. However, species in Nouragues had the general trend of peaking earlier during the year, producing fewer seeds and with higher variance than in BCI. We could detect a signal of ENSO events on seed production for both sites, with the general trend being an increase in fruit production after the increase of radiation and temperature associated with El Niño years. These results highlight the relevance of long-term monitoring for forecasting the variability of plant phenology to climate, which may have far-reaching implications for the survival of mammal populations and plant regeneration in tropical forests.

S13.OC.07

Application of Fourier spectral analysis to study phenology: the case of *Cecropia* in the Neotropics.

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Plant phenology is concerned with the timing of recurring biological events. Though phenology has traditionally been studied using intensive surveys of local flora, results from such surveys are difficult to generalize to broader spatial scales. In this study, contrastingly, we assembled a continental-scale dataset of herbarium specimens for the abundant and widespread genus of neotropical pioneer trees, *Cecropia*, and applied Fourier spectral and cospectral analyses to investigate the reproductive phenology of 35 species. Our analyses detected annual frequencies in flowering for many species previously believed to flower year-round. We further investigated the relationships between phenology and climate seasonality, showing strong associations between phenology and seasonal variations in precipitation and temperature. We also discuss the variation in patterns within and among climatic regions. Our findings indicate that herbarium material is a reliable resource for use in the investigation of large-scale patterns in plant phenology, offering a promising complement to local intensive field studies. In addition, we have shown that Fourier analysis can be easily applied to understand plant phenological patterns and succeeds where other statistical methods often fail. By linking phenology and climate at a continental scale, this study will help us to better understand the response of forests to climate change.

S13.OC.08

Comparative phenology of two parasitic plants of the genus Struthanthus (Loranthaceae) infesting two different hosts.

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Loranthaceae is the best known and widespread group among mistletoe families in Brazil, comprising 73 genera being *Struthanthus* the most diverse and well-studied one although these studies have been focused on its embryology, taxonomy and anatomy leaving a gap on the host-parasite relation issue. Concentrating on this, the present study aimed on comparing the phenology of *S. vulgaris* and *S. flexicaulis* and correlating them to the hosts' phenology and also to environmental parameters. As proposed by Fournier (1964) the method applied was to evaluate phenological intensity of the events involving flower/fruit emergence, leaf changing and epicortical roots growth, dividing these events into phases and quantifying each phase. The results showed that parasite leaf changing phenology is correlated to the diciduousity of the host. While infesting a deciduous host (*Tipuana tipu*) the parasite shows an increase of about 10% on the intensity of senescent leaves, in comparison to the parasite while infesting a non-deciduous host (*Psidium guajava*). The occurrence of old leaves on the parasite was also simultaneous to the occurrence of old leaves and dry mature fruits on the host tree, which can indicate an hormone flux from the host to the parasite influencing on the phenology of the latter. In respect to comparison between *S. vulgaris* and *S. flexicaulis* the results showed that the two parasites exhibit opposite phenologies for the reproductive phases. Corroborating these results, the correlations with environmental parameters (α=0,05) showed a negative correlation between the solar irradiation and the end of flower presenting in *S. vulgaris* and a positive correlation for the same parameters in *S. flexicaulis*. This can indicate that the opposite season distribution of flowering on these two plants may be related to the annual variation on solar irradiation, which can also reflect on the seed dispersal of these parasites, avoiding competition for the disperser bird species.

S13.OC.09

Monitoring tree growth and phenology in restored forests

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Over the last century, the Brazilian Atlantic rainforest has suffered strong impact due to deforestation for agriculture and grazing activity. Natural forest areas that had been damaged are now being restored either naturally, or by means of native species plantations. We gathered 6-year girth increment and phenological (flushing, leaf fall, flowering and fruiting) data of up to 35 species to evaluate radial growth and phenology in successional forests and reforestation areas in the Atlantic Forest, southern Brazil. We investigated whether these patterns can be distinct according to factors such as soil type, ecological group, deciduousness and successional gradient. In a short-term girth increment analysis (12 months), pioneer species had significantly superior growth than non-pioneer species and these two groups were also different when we considered biomass accumulation (non-pioneers: 410 kg and pioneers: 255 kg). In a long-term study of two pioneer species, we found a consistent pattern of distinguished growth between soils along the 4 years. One species had significantly increased growth in Cambisol when compared to Gleysol while the other did not show any distinction between soils. Studying phenology of some species for two years, we also found a tendency of shifts in the phenological patterns of the communities along the successional gradient, especially regarding time of occurrence. The combined results of our studies indicate that restoration actions in the region have been playing an important role to reduce the effects of fragmentation and human activity. Furthermore, monitoring tree growth and phenology in these areas may provide important information about the success of restoration approaches.

S13.OC.10

Studying phenology through a morphological and anatomical retrospective analysis under tropical climate. An example on *Parkia velutina*

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Most studies on tropical plant phenology have focused on patterns of flowering, fruiting and leaf-shedding. Field surveys are used in most studies, some of them relying on remote-sensing data. Phenological examinations of cambium are scarces, despite the importance of secondary growth to dendrochronology and retrospective growth-ring analysis. We studied primary and secondary growth at scales from within-individual to populations, using two complementary methods: a field survey and a retrospective analysis based on morpho-anatomical growth markers.
We worked in French Guiana on *Parkia velutina*, an emergent tree of Neotropical rain forests. We collected dominant branches from 14 adults and identified growth markers that delimited longitudinal and radial increments. We coupled this retrospective analysis with a 2-year phenological survey of (i) leaf-shedding and growth on twenty trees every month and (ii) the repeated collection of microcores from five trees every fifteen days to determine intra-annual cambial activity (i.e. formation of secondary xylem).
Successive growth units and growth rings were easily identifiable. These structural regularities traduce the phenological cycle defined by leaf shedding, growth-unit elongation and growth-ring formation. Within individual trees, we found this cycle to be synchronous across all growth axes. The cycle was essentially annual, with some slight variability. At the population scale, trees were unsynchronized. Primary and secondary growths were correlated: the peak of cambial activity occurred when leaves were mature. Conversely, little cambial activity occurred when leaves were senescent or young, or branches were leafless.
Our study shows that retrospective analysis and field survey are two complementary approaches to understand plant phenology and to interpret morpho-anatomical structure. Dating a branch by counting the number of growth units or growth rings is possible in many years with a reasonable error. Nevertheless, estimating their precise month of formation in order to study climatic influences remains difficult.

S13.OC.11

REMOTE PHENOLOGY: APPLYING DIGITAL IMAGES TO MONITOR LEAF PHENOLOGY IN A BRAZILIAN CERRADO SAVANNA.

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Plant phenology has gained importance in the context of global change research, stimulating the development of new technologies for phenological observation. Digital cameras have been successfully used as multi-channel imaging sensors, providing measures of leaf color change information (RGB channels), or leafing phenological changes in plants. We monitored leaf-changing patterns of a cerrado-savanna vegetation by taken daily digital images. We extract RGB channels from digital images and correlated with phenological changes. Our first goals were: i) to test if there is any statistical difference between time series from different hours of the day, ii) to test if time series from different regions of interest (ROI) in the image differ from a combination of ROIs or the total image. A digital hemispherical lens camera was setup at the top of a 18 m high tower to automatically take a daily sequence of five JPEG images per hour, from 6:00 to 18:00h. The present study was based on the analysis of over 2,700 images, recorded between August 28th and October 3rd, 2011. The image analysis was conducted by defining ten ROIs in the original digital image, including total or partial images, and six plant species. We calculated the relative values of green (% of Green) of each image and tested for correlations using ZNCC metric. Our preliminary results indicate that: (i) midday hours are the best for cerrado-savanna remote phenology, (ii) plant species ROIs are more sensitive to leaf changes than the combination of several ROIs or community images, and (iii) differences among species' ROIs may be related to its particular leaf change strategy.
(Financial Support FAPESP and CNPQ)

S13.OC.12

Phenology, climate change and human-induced disturbances: a review

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Phenology has offered a significant contribution to our understanding of global warming effects on plants, mainly supported by data from North Hemisphere and temperate species. On the other hand, phenology shifts are just occasionally associated to other man-induced disturbances, such as fragmentation. Here I summarize the outcomes of an extensive review of tropical phenology research and its potential contribution to integrate fields and understand the effects of global warming and anthropogenic disturbance within the tropics. The phenological research on Neotropics has shown an astonish increase in the number of papers over the first decade of this new century. Nonetheless, long-term phenological research, or studies addressing plant responses to environmental heterogeneity are still scarce and papers addressing new technologies for on-the-ground phenology monitoring are still lacking. I also address whether and how tropical plant phenology can contribute to identify ecological and evolutionary responses to natural and man induced environmental disturbances. I explore innovative research approaches, such as near remote phenology monitoring using digital cameras or urban phenology and present forthcoming results on tropical plant phenology integrated to ecological research.

S13.P.01

Phenology and reproductive patterns of a tropical dry forest at different successional stages in the Espinhaço Moutains, southeastern Brazil

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This study aimed at describing the differences on vegetative and reproductive phenology, as well as pollination and dispersal syndromes, across successional stages from a Tropical Dry Forest on limestone outcrops in Serra do Cipó, Minas Gerais, southeastern Brazil. The phenological behavior was recorded monthly from January 2009 to December 2010, totalling 24 months. In each fragment, we delimited three plots of 20x50m totaling 0.3 ha per successional stage. These plots were located 0.1-0.5 km apart whereas the two fragments were 3 km apart from each other. In each plot, two 3x50 m sub-plots were set up and all individuals with a diameter at breast height (DBH) greater than 5 cm were marked and sampled. A total of 247 individuals and 27 species were recorded in the six TDF plots in Serra do Cipó. In the intermediate stage, we found 124 individuals from 10 species, whereas 123 individuals from 21 species were recorded in the late successional stage. Insects were responsible for more than 60% of the pollination, while bats responded for more than 10% of the pollination syndromes. Considering the number of individuals, Zoochory was responsible for more than 15% of the dispersion, while Anemochory responded for more than 60% of the dispersion syndromes. The vegetative phenology responded to the climate conditions since leaf production and fall were synchronized for all species. The reproductive phenofases took place throughout the wet season; although some isolated events were recorded in the dry season. This study reinforces the importance of secondary forests for the maintenance of some ecosystem functions and services.

The study was supported by FAPEMIG and CNPq.

S13.P.02

Seed production differences of the Andean oak *Quercus humboldtii* Bonpl. in tow Andean forests of the Colombian Eastern Cordillera.

Gonzalez A

Knowledge of mechanisms of tree species reproduction under natural situations including fruit and seed production patterns is very important for forest management strategies. Considering the influence of abiotic factors such as soil characteristics, humidity and rainfall on fruiting phenology, we studied fruit production patterns of the Andean oak (*Quercus humboldtii:* Fagaceae) in two forest sites of the Colombian Eastern Cordillera (Cachalú and Patios Altos), under contrasting environmental conditions. At both sites, we monitored monthly fruit production of 15 trees in Cachalú and 11 in Patios Altos using fruit/seed traps placed under the tree crowns. In each site soil cores were extracted below the litter layer 20 cm depth, and soil characteristics and nutrients were analyzed. In general, trees in Cachalú produced more fruits than in Patios Altos, as well as mean fruit mass (wet and dry weight) was significantly higher in Cachalú. At both sites, oak fruiting peaked from April to May, when the highest rainfall occurs. We found positive correlations between fruit production and rainfall one month prior. High phosphorus (P) and potassium (K) were the main variables for explaining the high production. In contrast, high aluminum (Al) contents explained the low production found in Patios Altos. We discuss the importance of including fruit production for oak management strategies, such as restoration and reforestation programs.

S13.P.03

Flowering phenology and fruit set in *Anadenanthera falcata* (Fabaceae) a common tree of the Brazilian cerrado savanna: comparison between pasture, edge and interior

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We investigated whether habitat disruption affects plant size structure, reproduction, and seedling establishment of *Anadenanthera falcata* (Fabaceae), a cerrado-savanna tree. We compared *Anadenanthera* trees in the interior (n = 85), the edge (n = 74), and in a nearby pasture (n = 26), regarding their flowering synchrony, flower and fruit production, fruit and seed set, pre-dispersal seed predation and seedling establishment. Trees in the pasture were larger than trees on the edge and interior. Timing of first flowering and synchrony also differed among trees in the three environments. Trees in the pasture produced the highest number of flowers and fruits, yet fruit set was greater within the cerrado savanna. Seed set did not differ across environments. Pre-dispersal seed predation differed among environments, with lower seed damage among pasture trees. Conversely, we just found seedlings on savannas' edge and interior. The lack of seedling and small size-class plants in the pasture was related to livestock grazing. Therefore, isolation affected the plant size structure and reproduction of *Anadenanthera* trees. We argue that plant size structure and the flower phenology explains the flower and fruit production and the fruit set of trees in the cerrado savanna, and that the self-compatibility breeding system caused a similar seed set regardless of the environment.
(Finnancial support: FAPESP and CNPq).

S13.P.04

Vegetative phenology and colleters secretion in Rubiaceae species from cerrado and semideciduous forest in São Paulo state

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Studies focusing on the phenology of several species, phylogenetically related, could help understand about environmental constraints that may act on the dynamics of these biological events. In this sense, Rubiaceae is an interesting model, being well represented in Brazil, with 18 tribes, 130 genera, 1500 species distributed throughout several vegetation domains. In the present study we evaluated the phenology of 17 species of Rubiaceae, distributed in five tribes. We monitored eight species occurring in cerrado and nine in semideciduous forest in São Paulo state, recording the intensity percentage of each vegetative phenological phase monthly, from May, 2011 to February, 2012. Cerrado, a savanna-like vegetation, is characterized by its marked seasonality, with definite rainy and dry seasons; well-drained soils, usually poor, shallow, with high aluminum content that prevents forest development. The plants are always exposed to sunlight. Instead, despite the same climate, the semideciduous forest is characterized by deeper and more fertile soils, the presence of a canopy and lower light intensity in the understory. The species studied in both vegetation types presented evergreen except *Tocoyena formosa* and *Guettarda viburnoides*, that occur in cerrado, which lost their leaves during the dry season. The evergreen species showed a tendency to increase the leaf-fall in dry period with sprouting distributed throughout the studied period. Hydric deficit can promote the leaf-fall in different environments, however, not limiting the maintenance of mature leaves and the new leaves production of most species. The phenological pattern observed in this study, was verified for other Rubiaceae species from tropical rain forest suggesting that endogenous rhythms may influence the phenological pattern of the species in this family. Vegetative apices in Rubiaceae are covered with mucilaginous secretion produced by colleters, in the sprouting period, which may contribute to a longer leaf life by protecting leaf primordial against desiccation and herbivory.

S13.P.05

Flower and fruit production in four species from Zingiberales order in central Amazonia: denso-dependence, edaphic condition or light variation are more important?

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During eight months we have followed the reproductive phenology of *Heliconia acuminata, Ischnosiphon arouma, I. martianus* and *Monotagma spicatum* in an area in central Amazonia and tested whether the flowering and fruiting were influenced by the variation in soil phosphorus content and C:N ratio (question 1), light (question 2), and abundance of adults (question 3). Samples were conducted in Reserva Ducke, Manaus in 30 plots of 250 meters of length and 10 meters wide, distant 1 km from each other. We considered individuals flowering and fruiting, herbaceous plants with flower buds, open and/or closed flowers, mature or immature fruit, since the distance between each reproductive individual was greater than 0.5 meters. In all species the proportion of individuals flowering and fruiting were not related to the soil phosphorus content and C:N ratio. The density of adults and light affected only *H. acuminata*. Fruit production of *H. acuminata* was negatively correlated with density of adults, rising the hypothesis of competition (e.g. for pollen). On the other hand, light was positively related to flowering and fruiting, this last one, only marginally. There was a trend in all species of great increase in abundance, proportion of flowering and fruiting in places with light transmittance value above 4 red:far red. Our results show no direct influence on the availability of soil nutrients on flowering and fruiting. Light incidence showed a nonlinear effect on the proportion of individuals flowering and fruiting, particularly in places with transmittance value greater than 4 red-far red. Thus, it is likely that some understory herbs fructify more in gaps or even only fructify in high light incidence sites rather than in low light incidence environments.

S13.P.06

Use of Vegetation Index in the Analysis of Fructification Phenology in a Pantanal Mesoregion of Brazil

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Phenological studies have traditionally been carried out through ground observations. However, in recent years, remote sensing (RS) using satellite-borne imaging systems has been widely adopted to monitor vegetation phenology. The fruiting phenology of gallery forest plant communities was studied. Ground data on the fruiting phenology was gathered, during the course of one year, and compared with Landsat TM images, with application of the following indices: NDVI (Normalized Difference Vegetation Index), SAVI (Soil-adjusted Vegetation Index), LAI (Leaf Area Index) and MVI (Moisture Vegetation Index).The study was conducted in the Piraputanga Hills, Aquidauana Municipality, Mato Grosso do Sul State, Brazil, in an area called “Vale das Bruxas” (20°27’12.8”S, 55º 29’ 49.4”W). The Piraputanga region is inserted in the geomorphological context of the Maracaju Hills, in a Pantanal mesoregion. Comparisons of the efficiencies of different indices in detecting changes in fructification phenology were made. Values of all four indices decreased during the dry season. This could have been a consequence of the decreasing quantity of chlorophyll in the plants during the drier season, involving low water availability and decreasing photosynthetic rates. The fact that seasonal changes in air temperature were relatively small suggests that it was principally the water balance that limited the vegetation growth. Because the numbers of species and individual plants bearing fruit in the plant community increased during this period, the VI’s were inversely proportional to these abundances. The lowest values of the VI’s, coincident with high production of anemochoric fruits, could also have been related to the loss of chlorophyll due to fruit maturation. The peak values for zoochoric fruits occurred in December, when there were increases in all indices, especially the LAI. The NDVI was the least accurate in reflecting the changes in vegetation phenology.

S13.P.07

Phenology and reproductive system of *Helicteres velutina* K. Schum. (Malvaceae): a species with "footmade" pollination by hummingbirds

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Helicteres species are pollinated primarily by hummingbirds, moths and bats. While in ornithophilous species pollen is often deposited in the head and/or near the beak of hummingbirds, *H. velutina* flower morphology can influence access to resources and consequently the site of pollen deposition, compromising the service of pollination vectors. This study focuses on phenology, breeding system, the sequence of anthesis and activities of visitors in the pollination process of *H. velutina*, recording the different sites of pollen deposition on pollinators. *Helicteres velutina* is an ornithophilous species present in the PARNA Catimbau, which features continuous flowering with two peaks per year (March and June) during the rainy season in the region. The flowers have free red petals with cup-shaped tube calyx and gynoecium and androecium raised by an androgynophore, taking nectar as the main resource (33.14µl of nectar with 26.38% sugar). Pollen viability is 97.82% and there are about 146,000 pollen grains per flower (P/O ratio=1,834). Although self-compatible, *H. velutina* shows protandry as a mechanism to prevent autogamy, thus depending for its vector biotic. The pollinators of *H. velutina* were three species of hummingbirds, *Chlorostilbon lucidus*, *Chrysolampis mosquitus* and *Eupetomena macroura* (Trochilinae), which contact the pollen grains with their feet and/or venter part of the body. Despite these local regions are less efficient in pollen transportation due to the large waste of grain, the results show that the natural fruit-set does not differ from manual cross-pollination (χ^2=2.84, df=1, p=0.09). So, we suggest that *H. velutina* is suitably adapted to pollination by hummingbirds, and that specific regions of deposition of pollen as feet and belly are very selective locations that may not affect reproductive success, and even promote the plant species by reducing interspecific competition for pollinators.

S13.P.08

Natural edge influences the phenology and reproduction of *Gomidesia blanchetiana* (Myrtaceae), an understory Atlantic Rainforest treelet

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Forest edges change abiotic and biotic factors that may affect plant phenology and reproduction. Understory plant species are the most susceptible to those changes. We investigate whether the natural edge along an Atlantic Rainforest river affects the phenology, pollination and reproductive success of the understory species *Gomidesia blanchetiana* O. Berg (Myrtaceae), in Northeastern São Paulo State, Brazil. We monitored monthly the reproductive and vegetative phenology of 38 individuals in forest interior and 38 in natural edge during three years (April/2006 to March/2009). We quantified the number of inflorescences, flower buds and unripe fruits per individual and respective reproductive success; flower size and size/weight of ripe fruits and seeds; frequency of floral visitors. All phenophases were seasonal, concentrated during the super-humid season except for ripe fruits that occurred in the humid season. *G. blanchetiana* showed high intraspecific synchrony and similar phenological patterns between edge and interior, but the onset and peak dates occurred about 10-15 days earlier in natural edge. Forest interior presented larger inflorescences and longer flower duration, while natural edge presented the largest flowers, ripe fruits and seeds. However the number of inflorescences, reproductive structures and reproductive success did not differ between habitats. Bees were the most frequent floral visitors and three species were considered as effective pollinators. Natural edge presented the highest richness and abundance of floral visitors and higher visitation rates of effective pollinators and pollen thieves than forest interior. We conclude that natural edge slightly influences phenological patterns, but distinctly affect pollination rates and reproduction of *G. blanchetiana*, highlighting the role of edges on the reproduction of tropical rain forest trees. (Finnancial support: FAPESP and CNPq).

S13.P.09

Reconstructing the past phenological history of tropical trees: The illustrative case of *Recordoxylon speciosum* (Benoist) Gazel ex Barneby.

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Most studies on trees growth and phenology typically rely on time-consuming field surveys. However, it is possible to reconstruct retrospectively a tree life history using morpho-anatomical markers such as growth-units (Gus) or growth rings (GRs). While these methods have proven their usefulness in temperate regions over the past twenty years, there are difficulties in tropical regions to identify markers that can be reliably "timed". Here we used a tropical deciduous leguminous tree, *Recordoxylon speciosum*, to test the informative potential of its primary growth and flowering markers for reconstructing retrospectively the phenological history of the branches.
We conducted retrospective descriptions on nine adult trees and we collected one dominant branch for each tree. We identified GUs along all constitutive axes of the dominant branches, and implemented for each GUs, the rank position of the GU from the apex and the state of meristem (alive / dead / terminal inflorescence). A 3-yr phenological survey (17 trees, 4 trees sampled) was performed in parallel to compare the two approaches.
Together with the phenological survey, morpho-anatomical markers permit to conclude that the development of each GU is annual. Our work thus shows that the annual, rhythmic and polycyclic habit of R. speciosum can easily be reconstructed back to 11 years. Importantly, our study demonstrates that, using simple and rapid methods based on morphological and structural markers, it is now possible to precisely retrace a posteriori the past growth and flowering events over a decade in tropical trees.

S14.OC.01

Separating facts from species - new data and new tools require a different approach for recording and storing information about plant species – The WikiFlora Iniative

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Plant species in the Amazon are circumscribed based on scarce evidence making species weak hypotheses that are continuously changing. Tradional emphasis on fertile specimens and specialist authority are no longer justified as new types of data, such as molecular sequences or Near-Infra Red spectroscopy, make sterile specimens of great importance for the understanding of what species are and how we recognize them. Moreover, bioinformatic tools and data repository strategies may create opportunities for non-specialists and even non-botanists to contribute to the understading of plant diversity in an active way. Sterile specimens comprise the great majority of specimens currently collected in the Amazon, but have been tradionaly neglected by taxonomists as irrelevant for species delimitation and naming, and are still not accepted by many herbaria. The fact that species of plants in the Amazon are weak hypotheses require that facts be separated from the classes we define and name, and facts are specimens or live plants in the field. Bioinformatics permits to organize, share and link enormous amount of information associated with facts, including the attributes of which classes (species) they belong too. Bioinformatics permits taxonomist and non-taxonomists to extract and integrate information about facts in diverse an innovative ways, which can be dinamically used for real-time assessment of species hypotheses. However, there are still many bioinformatic efforts, including the production of interactive keys, in which classes and facts are mixed altogether. Although efforts exist to store factual information of taxonomic value, including morphological and molecular (GeneBanks are the best example of repository of facts) data, there are still no standard protocols, repositories or indexing initiaves that would permit a different approach for species circumscriptions/naming and for the identification of plants. In this context, we discuss the development of bioinformatic tools by the WikiFlora Initiative, a partnership between INPA-MCTI and IBM-Brasil.

S14.OC.02

Using semantic web technology to build social networks for tropical plant identification

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A major limitation in plant species discovery and forest inventory work in the tropics is the difficulty in assigning individual plants to existing taxonomic concepts. Technological advances promise to make plant identification easier, with diagnostic keys, image recognition systems and use of DNA barcodes. However, the reference libraries that back these tools are still underdeveloped for many areas and plant groups, and data are often scattered across several digital resources. What can be abundant, however, is parataxonomists' time, and taxonomic specialists' enthusiasm for their own particular plant groups. We believe that if effectively harnessed this energy can transform tropical plant identification. We focus here on annotation of standardized images of plants.

While there exist a number of sites for sharing species images and offering identifications (e.g., iNaturalist, iSpot), in this age of exploding numbers of social networking sites we feel that building yet another centralized resource is unlikely to be the most successful approach. Instead, using Semantic Web tools to connect a distributed set of data, image and annotation resources could create a robust, decentralized, expanding community of botanists, amateur and professional, willing to create plant data and annotate images. Being able to host and retain control over data at institutional web domains should also facilitate data sharing among countries concern with biodiversity sovereignty.

The components of this model include: i) high quality images (of standardized plant organ views) produced on surveys, collecting expeditions and from herbaria, hosted on any image platform (even Flickr), ii) survey data easily translated from spreadsheets to RDF and posted anywhere convenient, iii) registration of these resources with generic Semantic Web crawlers, iv) portals that collate these open data and produce organized, easy-to-digest collages of images ready for annotation, and distributed RDF-format annotations made by experts, parataxonomists and the general public, v) automated notification of specialists that images of potential interest have been posted. Annotations include determinations ("plant A is probably taxon Q"), and matchings ("plant B at site X is the same as plant C and site Y"). Cross-site matching of 'morphotypes' creates useful taxon concepts and generates biogeographic distribution data, even without mapping to published taxonomic concepts. We will describe components of this model that are already working, and relate our recent experience developing taxonomic and biodiversity informatics capacity in Indonesia.

S14.OC.03

Models and estimators linking individual-based and sample-based rarefaction, extrapolation, and comparison of assemblages

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In ecology and conservation biology, the number of species counted in a biodiversity study is a key metric, but is usually a biased underestimate of total species richness because many rare species are not detected. Moreover, comparing species richness among sites or samples is a statistical challenge because the observed number of species is sensitive to the number of individuals counted or the area sampled. For individual-based data, we treat a single, empirical sample of species abundances from an investigator-defined species assemblage or community as a reference point for two estimation objectives under two sampling models: estimating the expected number of species (and its unconditional variance) in a random sample of (1) a smaller number of individuals (multinomial model) or a smaller area sampled (Poisson model), and (2) a larger number of individuals or a larger area sampled. For sample-based incidence (presence-absence) data, under a Bernoulli-product model, we treat a single set of species incidence frequencies as the reference point to estimate richness for smaller and larger numbers of sampling units. Although published methods exist for many of these objectives, we bring them together here with some new estimators under a unified statistical and notational framework. This novel integration of mathematically distinct approaches allowed us to link interpolated (rarefaction) curves and extrapolated curves to plot a unified species accumulation curve for empirical examples. We provide new, unconditional variance estimators for classical, individual-based rarefaction and for Coleman rarefaction, long missing from the toolkit of biodiversity measurement. We illustrate these methods with datasets for tropical beetles, tropical trees, and tropical ants. Surprisingly, for all datasets we examined, the interpolation (rarefaction) curve and the extrapolation curve meet smoothly at the reference sample, as do the curves representing 95% confidence intervals, allowing rigorous statistical comparison of samples for both rarefied and extrapolated richness values.

S14.OC.04

An Automated Remote Biodiversity Monitoring Network (ARBIMON)

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There is an urgent need to increase the temporal and spatial coverage of ecological data collection in response to the myriad of anthropogenic threats (e.g. extinction crisis, global warming) to global biodiversity, but fortunately the technology exists to do it. During the last four years, we have developed the Automated Remote Biodiversity Monitoring Network (ARBIMON), and we have demonstrated how inexpensive monitoring stations can collect a continuous stream of biodiversity acoustic data. Although much of the process is automated, and for many species it will be possible to automate species identification, a major limitation is that most end users do not have access to the necessary tools to manage and analyze these large data sets.

To address this need, we have developed applications using Machine Learning techniques to automate species detection. Specifically, an interactive web application allows users to visualize the results of the initial algorithm, select correct responses, and incorporate the correct responses into the training data to improve the model, and then reanalyze the data. These tools and the iterative process allow the user to quickly build accurate species identification algorithms. It is important to note that after a model has been approved, the system will be able to evaluate recordings without any human intervention. Researchers working with our web application have developed algorithms for birds, amphibians, and monkeys using the nearly one million recordings uploaded to the ARBIMON network. Most of these recordings come from our permanent stations in Sabana Seca and El Verde in Puerto Rico and La Selva in Costa Rica but there is a large amount that has been uploaded by the researchers using a variety of recording devices.

S14.OC.05

New approaches to DNA barcoding of tree diversity in Amazon forests

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Plant DNA barcoding has great potential for taxonomic discovery and floristic inventory of diverse tropical forests. However, this approach faces several obstacles, including (a) large numbers of closely related species that cannot be distinguished by standard DNA barcode loci (b) many taxonomically undescribed species, (c) the absence of a plant DNA barcode reference library, and (d) the enormity of the task, with tens of thousands of putative tree species in the most diverse tropical forests. This talk discusses three approaches to advance DNA barcoding as a tool of floristic inventory in tropical forest: (1) the use of forest inventory plots and herbarium collections to develop DNA barcode reference libraries, and (2) utilization of next generation sequencing platforms to increase the scale of DNA barcoding efforts, and (3) development of nuclear DNA barcode loci for discrimination of taxonomically challenging taxa.

S14.OC.06

Leafsnap: A Mobile application for plant identification using image recognition technology

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Ecologists often need fast, reliable, and easy-to-use field guides for plant identification. Traditional paper-based guides or more recently introduced electronic field guides essentially use the same methodology, which is based on following dichotomous keys or selecting specific information on morphological features of the focal plant. With these types of identification aids a certain level of botanical skill is usually required and in many cases a specific feature needed to make a correct identification (i.e., flower, fruit) is unavailable. We have developed a new automated identification tool that makes use of computerized image recognition technology. The tool, called *Leafsnap*, employs an algorithm that establishes the contours of the leaf of an unidentified tree and uses uniquely developed visual recognition software to find a match from a previously constructed digital library of leaf images. This free mobile app, currently available for the iPhone and iPad, identifies trees from photographs of their leaves and contains high-resolution images of their flowers, fruits, seeds, and bark. After taking a photo of a leaf of the plant to be identified, the iPhone will compare the photograph to a central library of 8000 images that have been collected and stored in the home database server. A ranked list of possible species is returned to the user at which time *Leafsnap* displays high-resolution images of a branch, leaf, flower, fruit, and bark of the identified species. The app also supplies descriptive information as well as native distribution. *Leafsnap* returns search results in 5 to 20 seconds, depending on the speed of the network connection. Ultimately it is up to the user to make the correct determination by using the high-resolution images in the database to compare critical diagnostic features with the species under question. Once an identification is made, the image is automatically sent to *Leafsnap's* home database along with mapping information taken from the smart phone's GPS. This information will eventually be used to track the geographic ranges of trees as they change over time. Currently the app is specific to about 200 tree species of the northeastern United States. It is planned that within two to three years *Leafsnap* will cover all the trees of North America, nearly 800 species in total. Tropical trees offer a greater challenge but will not be far behind.

S15.OC.01

The value of sharing primary, research-grade biodiversity data: Applications to biodiversity inventories, understanding species' distributions, and effects of environmental change

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This symposium provides an overview of new developments in the world of sharing biodiversity data openly and freely; this contribution provides the *why* … that is, why bother sharing such data at all? I argue that broad sharing of such data allows novel insights on a number of fronts, which are otherwise not possible or accessible to biodiversity researchers. I provide examples of (1) completing the global inventory of bird species and their distributions, (2) characterizing in great detail the distribution of a single species, and (3) the effects of global climate change on the distribution of a single species. In each case, the insights are potentially exciting, and the uptake of both data sharing and use of these inferential tools has been enormous. The result is a novel view of biodiversity pattern, in which small- and large-scale patterns can be discerned, characterized, and understood in detail.

S15.OC.02

ADVANCES PROMOTED BY THE INCT-VIRTUAL HERBARIUM OF BRAZILIAN PLANTS AND FUNGI

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The Virtual Herbarium of the Brazilian Plants and Fungi is one of the National Institutes of Science and Technology supported by the government to stimulate and maintain research networks in the country. Its goals include the integration of data about plants and fungi collected and deposited in the country or abroad. The herbarium provides a free and open data infrastructure for the scientific community, for policy and decision makers, and for society. As part of its mission the INCT-Virtual Herbarium is helping to: expand the knowledge about the diversity of flora and mycota in Brazil; improve the quality of the collections; promote the formulation of public policies to ensure the sustainability of collections, the training of taxonomists, and support for biodiversity studies; encourage open access to data and information in an useful format. At the beginning formed by 25 herbaria, the INCT net now has more than 60 participants, from all Brazilian regions. Activities of the Virtual Herbarium (http://inct.florabrasil.net) also include research, training, and knowledge transfer to society. Research activities are related to studies on taxonomy, the integration of Botany/Mycology/Information Technology, and the use of species-occurrence data to support the formulation of public policies regarding diversity and conservation of fungi and plants. During its first three years the Institute promoted over 25 courses on taxonomy and herbarium management, benefiting more than 400 students and technicians; visits of 35 specialists who revised/identified over 24,000 exsiccates in 43 herbaria. As shown by the reports, only last year over 46 million records were accessed, demonstrating the importance of connecting research groups and enabling free access to information. The INCT-Virtual Herbarium has proven to be an efficient and autonomous way to disseminate scientific knowledge regarding Brazilian flora and mycota and represents a heritage that should be continuously supported and improved.

S15.OC.03

e-infrastructure to support biodiversity research in Brazil

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Addressing the challenge of sustainable development requires massive open exchange of data and tools across disciplines and national borders. The *speciesLink* network is an information infrastructure that offers free and open access to data from more than 200 biological collections that otherwise would be completely restricted to researchers with privileged access to natural history museums, culture collections and herbaria. Besides offering a searchable web interface that provides data in different formats, *speciesLink* offers a number of tools to improve the quality and to add value to the data and to produce different outputs based on the analysis of online records. *Data cleaning* reports are produced for each data provider and highlight "suspect" records indicated by applications that analyze species names, dates and geographic data. Online *indicators* show the network´s progress, geographic distribution, and many other features. The speciesLink network also serves data to several other important projects such as the *Virtual Herbarium of Flora and Fungi* and the *List of Species of the Brazilian Flora*, a dynamic online platform that is continuously updated by taxonomists. Besides textual data, images of vouchers held at herbaria are also disseminated through the network. A new application that evaluates the number of records available per species is being launched. This new tool – *Lacunas* – determines geographic and taxonomic information gaps based on plant data that is available online. Data is also served to *openModeller*, a framework for ecological niche modeling, which may also be used to guide future field work. The challenge now is to make this e-infrastructure part of policy and decision making processes.

S15.OC.04

***Lacunas*: a new tool to help identify taxonomic and distribution data gaps of plants**

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Lacunas is a web interface developed by CRIA (Reference Center on Environmental Information) that generates detailed reports as to the availability of species occurrence records based on data from Brazil's *Virtual Herbarium* (*INCT-Herbário Virtual da Flora e dos Fungos*) and *The List of Species of the Brazilian Flora*. The List serves as a reference to species' accepted names and their synonyms. *Lacunas* presents a list of species grouped into 4 categories according to the number of available records: species with zero records, 1 to 5 records, 6 to 20 records and more than 20 records. For each species, the system presents a distribution map based on data served by the *species*Link network in real time, and data retrieved from the List of Species. The report also presents a table showing the number of records per year and other tables indicating the origin of the data (herbaria) and georeferencing status. The aim of this interface is to facilitate the analysis of specialists who can, based on this data, determine under-sampled species or geographic areas that have been neglected. Furthermore, curators and taxonomists can more easily identify gaps in digitizing and georeferencing data of important and representative collections for a given group of plants. Besides, as the report also presents a table with the number of records per species with consistent geographic coordinates, the data necessary for modeling species distribution is also readily available. In addition, reports on species included in Brazil's List of Threatened Plant Species are also available for the evaluation of specialists. Ultimately, *Lacunas* and the species distribution models that will be developed in the future may be used to define new strategies to increase our knowledge and understanding of Brazil's biodiversity.

S15.OC.05

Taking biodiversity informatics into the cloud

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Under the growing pressure of global change, knowledge about the world's biodiversity and the primary data to support this knowledge are becoming increasingly valuable. Great progress has been made to facilitate access to primary biodiversity data. Recent advances in the adoption of standards and the publication of primary data have pushed the scale of biodiversity informatics into the realm of "big data." With this increase in available data come new challenges that cut across all aspects of data handling and use. Challenges and emerging solutions to them will be reviewed, addressing issues associated with storage, scalability, performance, aggregation, discovery, integration, visualization, and sustainability.

S15.OC.06

EU-Brazil Open Data and Cloud Computing e-Infrastructure to Support the Analysis and Conservation of Biodiversity

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The main goal of EUBrazilOpenBio is to deploy an e-Infrastructure of open access resources (data, tools, services), to make significant strides towards supporting the needs and requirements of the biodiversity scientific community. This data e-Infrastructure will result from the federation and integration of substantial individual existing data, cloud, and grid EU and Brazilian infrastructures and resources across the biodiversity and taxonomy domain namely the *species*Link Network, the INCT Brazilian Virtual Herbarium, Catalogue of Life, OpenModeller, D4Science-II and Venus-C. The breadth and depth of the resulting data infrastructure and the openness of its resources will enable a large variety of new cost-effective, cross-disciplinary virtual research environment applications thus opening the way to its widespread adoption and exploitation by the worldwide biodiversity scientific community. Accelerating the creation of a data e-Infrastructure of open access resources pursues interoperability with end-user technologies and contributes to social, environmental agendas. Europe through international cooperation can facilitate the exploitation of European excellence and results in data infrastructure and cloud computing. Project goals include the development of two use cases: 1) Integration between Regional and Global Taxonomies; 2) Data usability and use of ecological niche modeling. The interoperation runs through all infrastructures: hardware & computing facilities, portals and platforms, scientific data knowledge infrastructures. Principal outputs: 2 user scenarios, a software platform with a specific Software Development Cooperation Environment, computational e-Infrastructure and integrated resources (dataset, services, platforms, computational and storage resources) offered to the biodiversity community, a consolidated community of biodiversity scientists, socio-economic impact report, an EUBrazil joint action plan on recommendations and future co-operation.

S15.P.01

The importance of humans to data management

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Data sharing is an emerging issue in ecological science, but the main issue preventing the change of paradigm is cultural, not technical, and the missing link is human. Researchers expect an automatic system in which data is magically documented and its quality assured, but most are putting their data in a single spreadsheet that only they can understand. Some errors can be detected automatically, but this does not dispense with proofreading to guarantee the quality and longevity of data. Due to the complex and dynamic nature of ecological data, a single data base to store all data is not efficient, so presently the best alternative is to work with a repository which stores metadata that can be searched to locate information (data). The metadata must be detailed and clear enough for other researchers to understand the data and replicate methods. A data manager is essential for curation of both data and metadata before the data become publicly available. Experience from the Brazilian Program for Biodiversity (PPBio) indicates that data and metadata need to pass three times between the data manager and the researcher before entering the repository. This means that if the data was deposited directly by the researcher, it would be useless for most potential users without supplementary information obtained by personal contact with the original researcher. The Knowledge Network for Biocomplexity stores more than 25,000 ecological datasets. GenBank, launched 30 years ago, stores sequences of more than 100,000 organisms, and the number doubles approximately every 18 months. According to Peter Forster more than half of the human sequences of mtDNA available in the database have errors. Data bases in ecology are in their infancy and we can avoid many of these errors by the simple expedient of putting a human in the system.

S15.P.02

Exsiccatae: an image service to e-taxonomy

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Scientists from biodiverse regions face huge challenges in gathering information about taxonomic richness. In Brazil, a megadiverse country, the availability of online plant catalogues is crucial for the work of researchers from different fields. As an attempt to fulfill this need, *CRIA* (Reference Center on Environmental Information) has developed *Exsiccatae*, an image service that is part of Brazil´s INCT-*Virtual Herbarium* (*INCT Herbário Virtual da Flora e dos Fungos*). The main goal of *Exsiccatae* is to provide a series of webservices associated to an image repository of plant specimens collected in Brazil, deposited in national or international herbaria and, consequently, repatriating data. Currently, two international collections are providing images of Brazilian specimens through *Exsiccatae*: The New York Botanical Garden and the Herbarium Musei Parisiensis (Saint-Hilaire collection). In addition, ten Brazilian herbaria are also serving images to the system. In the long run all collections that are part of Brazil's INCT-*Virtual Herbarium* are expected to participate. The first product of *Exsiccatae* was to serve images to Brazil's INCT-*Virtual Herbarium* associated to its textual data that is served by the *species*Link network. The second product is the *Imagem* website, which associates plant images, of both exsiccates and fresh specimens, to textual data retrieved from the INCT-*Virtual Herbarium* through a very visual and user-friendly interface. Links to other information systems at *CRIA* are available, through which users can easily retrieve other types of information about species such as geographic distribution, conservation status, accepted names and synonyms. As the images can be accessed in high resolution, *Imagem* ideally could be used for e-taxonomy, promoting the connection among collections and allowing scientists to make valuable contributions for improving the data in a much more straightforward way. This new tool represents an opportunity for an up-to-date taxonomy and may constitute an important tool for Brazilian researchers.

S15.P.04

THE NATIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY VIRTUAL HERBARIUM OF PLANTS AND FUNGI OF BRAZIL

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Created as one of the National Institutes of Science and Technology (INCT), the Virtual Herbarium includes more than 60 herbaria from all Brazilian regions. Promoting the articulation of researchers, students, and technicians, its goal is to provide to society in general, public authorities, and the scientific community, a high quality, botanical collections open data infrastructure accessible to the public by integrating the data held in Brazil's herbaria and repatriating data from collections of Brazilian samples held in foreign herbaria. Objectives of the INCT-Virtual Herbarium include making online sharing of non-sensitive herbarium data a fundamental principle of scientific conduct; improving the quality of the collections; providing basic data so that environmental sustainability becomes just as important as social and economic development in the analysis and formulation of public policies. The principal activities of the Institute are: research, training, and the transfer of knowledge to society. Research - includes two basic lines: Biological diversity and taxonomy of plants and fungi and the use of data on species distributions for the formulation of public policy on plant and fungal diversity. Training - A program of courses on advanced taxonomic techniques, training of curators and technicians in biodiversity informatics improving the quality of collections in Brazil and increasing digitization and distribution of data. Transfer of knowledge to Society - The identification of a specimen and its sharing in a free and open system is part of the fundamental strategy of transferring taxonomic knowledge to society. The dynamic integration of data and knowledge held in different collections and the generation of information can enrich the analyses of specialists in diverse areas such as the environment, health, agriculture and industry. This network will try to reach an increasing number of people and regions of the country, disseminating and improving taxonomic knowledge on Brazilian plants and fungi.

S16.OC.01

Plant DNA Barcodes and Community Phylogenies: How Highly-resolved Evolutionary Relationships Aid the Understanding of Community Assembly.

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In plant communities species number, functional traits, and phylogenetic history all contribute to characterizing biological diversity. Until now the phylogenetic component of community diversity has been particularly difficult to quantify in species-rich tree assemblages. We have now applied DNA sequence data from plant DNA barcode markers to construct highly resolved community phylogenies for tree species in forest dynamics plots and have used these phylogenies to provide the evolutionary component for understanding community assembly. We used the plant DNA barcodes *rbcL*, *matK*, and *trnH-psbA* in a supermatrix approach along with phylogenetic constraint trees to generate community phylogenies in both temperate and tropical environments. The conserved barcode gene region *rbcL* along with the constraint trees provide the phylogenetic backbone at the family and ordinal level for the community analyses while the faster-evolving barcode gene regions *matK* and *trnH-psbA* permit the high resolution of the terminal twigs of the tree, i.e., the species. These results for forest dynamics plots in Panama, Puerto Rico, Maryland and Virginia illustrate how highly resolved phylogenies derived from DNA barcode sequence data combined with constraint trees are particularly useful in comparative analyses of evolutionary diversity and enhance research on the interface between community ecology and evolution.

S16.OC.03

Phylogenetic turnover in tropical tree communities - testing evolutionary and ecological hypotheses on species assembly rules at contrasting spatial scales

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The phylogenetic structure of communities can help decipher the respective roles of niche assembly rules and dispersal processes in shaping the actual composition and organization of species within natural communities. In this perspective, coupling a detailed species phylogeny with analyses accounting for environmental gradients in species-rich communities can be helpful to address questions about the importance of environmental filtering, competitive exclusion and niche evolution. At a fine spatial scale, we applied this approach on the tree and shrub species occurring in a 50 ha plot of rainforest in Central Africa (Korup) where we used plant DNA barcodes to construct a phylogeny of the principal species. At the regional and inter-continental scales, we report patterns of phylogenetic turnover of tree communities along rainfall gradients in Panama Canal Watershed and Western Ghats. We show how the impact of environmental filtering and dispersal limitation can be disentangled by comparing species turnover and phylogenetic turnover when the latter is measured by the PI_{ST} metric.

S16.OC.04

eDNA metabarcoding: high throughput taxa identification

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Ecosystems across the globe are threatened by climate change and human activities. New rapid survey approaches for monitoring biodiversity would greatly advance assessment and understanding of these threats. Taking advantage of next-generation DNA sequencing, we tested an approach we call DNA metabarcoding: high-throughput and simultaneous taxa identification based on a very short (usually less than 100 base pairs) but informative DNA fragment. Short DNA fragments allow the use of degraded DNA from environmental samples. All analyses included amplification using plant-specific versatile primers, sequencing and estimation of taxonomic diversity. We tested in three steps whether degraded DNA from dead material in soil has the potential of efficiently assessing biodiversity in different biomes. First, soil DNA from eight boreal plant communities located in two different vegetation types (meadow and heath) was amplified. Plant diversity detected from boreal soil was highly consistent with plant taxonomic and growth form diversity estimated from conventional above-ground surveys. Second, we assessed DNA persistence using samples from formerly cultivated soils in temperate environments. We found that the number of crop DNA sequences retrieved strongly varied with years since last cultivation, and crop sequences were absent from nearby, uncultivated plots. Third, we assessed the universal applicability of DNA metabarcoding using soil samples from tropical environments: a large proportion of species and families from the study site were efficiently recovered. Finally, the current results obtained from soil DNA and concerning animals (earthworms and termites) will be presented. These results open unprecedented opportunities for large-scale DNA-based biodiversity studies across a range of taxonomic groups using standardized metabarcoding approaches.

S16.OC.05

Spatial structure of the plant community at Nouragues, French Guiana: preliminary insights from a metabarcoding survey

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New rapid approaches for monitoring biodiversity should greatly advance assessment of threat status on biodiversity, and should provide a crucial addition in the ecologist's toolkit. Taking advantage of next-generation DNA sequencing, simultaneous taxa identification based on short (usually less than 100 base pairs) but informative DNA fragment is now possible. Because they are short, these DNA barcodes may be used for degraded (extracellular) DNA from environmental samples. We tested the applicability this approach using 77 soil samples at the Nouragues Ecological Research Station, French Guiana. We focused this study on plant species, and used a small fragment of the trnL plastid DNA intron (P6 loop). We show that this technique recovers a large proportion of the families encountered at this site, discuss possible biases, and interpreted the sequence abundances as retrieved by this method. We also replicated the sequencing using a fragment in the ITS region that is specific of the family Sapotaceae. We used this analysis to show that a combination of small DNA fragments yields a high level of taxonomic resolution, as compared with universal plant DNA barcodes. This opens interesting avenues of research in conservation biology, community ecology, and plant systematics.

S16.OC.06

Below ground tropical tree species and phylogenetic diversity accessed through DNA barcoding and massively parallel sequencing.

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Species competition in diverse communities is reduced if each species is able to exploit different limiting resources or avoid competition through partitioning those resources in space. Above ground neighborhood interactions have been the focus of most studies in tropical forests to date, but represent only one way in which plants compete with one another. Plant interactions below ground via roots have been difficult to study in a systematic way because of the difficulty associated with identifying plant material from morphological analyses alone. The development of community-wide genetic resources such as DNA barcodes has the potential to transform our understanding of the mechanisms operating belowground in tropical forests that have been difficult to study previously. We describe a technique that uses a set of community wide DNA barcodes developed for trees and lianas on Barro Colorado Island, Panama and Roche 454 sequencing to understand belowground diversity of tree roots taken from soil cores. We sequenced bulk DNA extracts taken from fine roots from 95 soil cores across the BCI 50 ha plot at the DNA barcode *rbcL* in two 454 lanes and compared resulting sequences to a library of community-wide barcodes. We find 234 species of trees and lianas, encompassing approximately ½ of all tree and liana species on the plot in a small fraction of the area indicating great potential for belowground competition within potentially large belowground neighborhoods. We find a mean of 13 species per core (median 12) and a range between 2 and more than 20 species. Finally, we examine patterns of phylogenetic structure among soil cores and the local plant neighborhood across spatial scales and find that below ground communities show more phylogenetic structure than expected at random given the above ground community implying a role for phylogenetic niche conservatism in belowground competition and nutrient specialization.

S16.OC.08

Testing the role of ecology and life history in structuring genetic variation across a landscape: A comparative ecophylogeographic approach.

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Traditional hypotheses to explain phylogeographic structure and species diversity such as rivers, mountains and refugia often fail to constitute general explanations for observed patterns, especially in lower latitudes. Limits to dispersal may vary in strength according to organisms' intrinsic biology. Ecological and life history variables may thus be important in explaining the observed patterns of genetic variation. Amphibians are particularly tied to their environment and have a wide variety of life history characteristics that may influence their ability to disperse or survive in novel environments. Phylogeographic studies of Central American amphibians have revealed a variety of historical patterns with little commonality among species. We developed a novel approach to elucidate the role of life history variation in generating phylogeographic structure that may be a precursor to species formation. We sampled three amphibian communities in Panama. We employed DNA barcode data from the mitochondrial genes COI and 16S to quantify genetic variation among sites in 31 anuran species. To evaluate congruence in divergence times between species we used HABC analyses in two comparisons between the three localities in Panama. Simultaneous divergence between all species was rejected in both cases however, congruence in divergence times between groups of species was found. We generated ecological niche models for each species to estimate landscape resistance between localities. Ecological and life history variables were used to evaluate their importance in explaining the observed genetic divergence and congruence in divergence times. Our results suggest that elvational range and landscape resistance are important in explaining genetic variation. The value of environmental factors in generating phylogeographic structure and species diversity may thus be greater than usually thought and may provide a more general explanation than physical barriers for the genetic patterns we observe.

S16.OC.10

Spider trait evolution: unraveling the role of habitat structure, spatial scale and phylogeny

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Integrating phylogeny into community ecology can help to determine how species interactions and environmental characteristics affect species coexistence and trait evolution. We hypothesized that the variation in plant architecture contributes to trait and phylogenetic diversification and that architecture drives stronger trait labiality in hunting spiders compared to web-building ones. We thus tested (i) whether habitat structure (i.e., plant architecture) and the geographic distance are correlated with the phylogenetic and trait diversity of vegetation-dwelling spiders, and (ii) whether hunting and web-building spiders have differential trait diversification in response to plant architecture. We sampled vegetation-living spiders in five plant species in the *restinga* vegetation along 2200 km of the Brazilian coast, between latitudes -12 and -28. At the latitudinal scale, traits were clustered in relation to plant architecture and location (distance) and the phylogenetic pattern was random, which means that plant architecture and geographic distance are driving trait diversification independent of phylogenetic relatedness. For instance, large-leaved plants (e.g., bromeliads) select for large hunting spiders, while web-building traits are less variable in relation to plant architecture. These results suggest that in *restingas* (i) plant architecture select for spiders with specific body size, and (ii) hunting spiders' trait evolution is converging in response to plant architectural variation. Thus, habitat structure can drive spider body size evolution to distinct directions depending on their forage mode and the ability to use webs to hunt. Our results shed light on the understanding of how spatial scale, phylogenetic relatedness, and environmental characteristics are driving non-random patterns of community structure.

S16.OC.11

What do arthropods tell us about niche evolution in the neotropics?

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After playing a fundamental role in ecology, the concept of ecological niche is emerging as central for all aspects of biodiversity studies, effectively bridging the gap between phylogenetics and ecology. Using examples of Neotropical arthropods (insects and arachnids), I will highlight how combining molecular phylogenetics and Ecological Niche Modelling can shed new light on biogeographical patterns.
In the first part, I will investigate if local scale community interactions (both positive and negative) could influence broad scale Grinnellian niche evolution in a group of neotropical mimetic butterflies (Ithomiines). In the second part, I will use phylogenetic comparative method to investigate the potential signature of adaptation in shaping the current pattern of niche evolution in a group of leaf litter arachnids (Ricinulei).
Both examples highlight the necessity of studying the underlying processes and mechanisms responsible for the current patterns of observed niche conservatism/dissimilarity.

S16.OC.12

Untangling phylogenetic and geographic effects on host plant ranges of phytophagous insects

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Unravelling the ecological processes influencing the structure of interaction networks is among the key challenges in community ecology. In host-parasite interactions, the host range of each parasite species is the main driver of interaction structure, and is considered to be largely caused by phylogenetic restrictions. We use a database on interactions between Asteraceae species and flower head endophagous insects to address the following questions: 1) What is the relationship between geographic and host-plant range of phytophagous insects? 2) Does this relationship depend on the host range metric used? This database comprises 168 herbivore species in the families Tephritidae, Agromyzidae, Tortricidae and Pterophoridae, reared from 360 plant species, in more than 2700 samples from 26 locations spanning 15 degrees of latitude in mountain ranges and Cerrado savannas in southern and southeast Brazil. The host range of each species was calculated by three metrics: richness (# of host plant species), diversity (Shannon diversity index weighted by samples) and higher taxonomic diversity (number of host tribes). Geographic range was assessed as the number of sites in which each herbivore species was reared. We built a null model by sampling plant taxa present in our database to test the role of the taxonomic structure in host plant use. There was a positive relationship among geographic range and all host range metrics, even though the herbivore families were differently affected. Only Tephritidae species showed taxonomic constraints in host plant use, with fewer host plant tribes than expected for a given number of host plant species. Tephritid flies also had the highest specialization and lowest increase in host range with geographic range. Our results suggest that specialized taxa are strongly influenced by phylogenetic restrictions to potential interactions whereas generalist species are more influenced by the abundance of available hosts than by their phylogenetic affiliations.

S16.P.02

Fern phylogenetic differentiation in a tropical forest: the role of life forms structuring community

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Phylogenetic structure of a community can explain aspects of evolution and coexistence in species assemblages. Also, can help to identify how evolutionary processes and environmental effects are related to certain characteristics shared or diverging among species. We studied fern community structure based on phylogenetic and taxonomic characters, as well as the effect of life form differentiation on community complexity. Sampling plots were placed in a tropical montane forest in northeastern Brazil. We found 78 fern species, belonging to herb (epiphyte, hemiepiphyte, rupicolous and terrestrial) and tree fern life forms. Fern community diversity and canopy openness were significantly correlated, however, species diversity and taxonomic distinctness presented inverse correlations with it. This allowed us to understand environmental filtering processes structuring the community. Among life forms, epiphyte and tree fern communities are phylogenetically aggregated, whereas other communities are randomly structured. We also analyzed epiphyte metacommunities on different phorophytes in terms of phylogenetic relatedness and found out that epiphyte communites on tree ferns and angiosperm trees diverge from each other. Our work reinforces the idea that conservation strategies in tropical forests targeted at fern communities must consider their complexity of life forms and their sensitivity to light disturbances. Moreover, we suggest that the fern community should be considered in studies that aim at creating conservation strategies due to their cost-benefit relationship. When studying fern community diversity it is recommended to take into account its diversity of life forms and its role in structuring the community. Our results indicate that fern community diversity combines species and phylogenetic diversity, and its structure is directly influenced by life forms.

S16.P.03

Phylogenetic Diversity in Rock Outcrop Plant Communities in Southeastern Brazil

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Inselbergs are known to present particular and highly specialized vegetation. A great environmental heterogeneity and availability of microhabitats are present and varies strongly due to substratum characteristics. Increases in area and substratum depth reflect an apparent gradient on water and nutrient availability, which may provide better conditions for establishment of different species. Thus, we postulate that species' distribution and composition within inselbergs will vary according to patch size and species' phylogenetic relatedness. A set of 26 vegetation patches of varied sizes (between 0.5 m^2 and 30 m^2) was censed to construct a presence/absence species/patch matrix. We aim to explore if co-occurring taxa display phylogenetic evenness or clustering. We calculate mean phylogenetic distance (MPD), mean nearest taxon phylogenetic distance (MNTD), net related index (NRI) and nearest taxon index (NTI), (significance: NRI - NTI < -1.96 evenness; NRI - NTI > +1.96 clustering) using Phylocom software. MPD was positively, but weak related to the patch area and number of taxa, respectively (r^2=0.18, p_{value}=0.026; r^2=0.30, p_{value}=0.0024), whereas MNTD decreased with increasing number of taxa (r^2=0.509, p_{value}=0.000020). NRI and NTI values were not significant different from randomly generated null communities, but mean values of all patches were negative in both index (evenness tendency). Thus, we have evidence to demonstrate that the capacity of occurrence in varied size of vegetation patches is independent of the phylogeny. Further studies, however, are necessary to test whether the above results can be confirmed when variation in abundance of species and functional trait diversity are included on the analysis of the inselberg plant community assembly.

S16.P.04

DNA barcodes for the identification of the heavily logged Amazonian timber species, Manilkara huberi, and related Manilkara species

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Earlier Amazonian studies have found that at least four species of *Manilkara* may be managed as "maçaranduba" timber, potentially causing severe population depletion in vulnerable species. Tools for accurate identification of both standing trees and logged timber are therefore urgently required. The accepted plant DNA barcode combination, *MatK*+ *RbcL* was evaluated for its ability to reliably differentiate the heavily logged species, *Manilkara huberi*, from some phylogeographically related *Manilkara* species, in comparison with some alternative DNA loci. *RbcL* was invariant among all *Manilkara* species tested, including the distantly-related African species *M. butugi*. *MatK* was also invariant among *Manilkara* species occupying overlapping ranges, inclulding *M. paraensis*, *M. cavalcantei*, *M. bidentata* and its subspecies *M. bidentata* subsp. *surinamensis*; and provided just one diferentiating character in the Atlantic rainforest species, *M. multifida*. The alternative chloroplast locus, the *psbA-trnH* intergenic spacer, which has been used in some plant DNA barcode studies, was somewhat more variable and provided some useful, but ultimately insufficient, autapomorphic characters, as well as some homoplastic characters. The locus was also found to be quite difficult to sequence, using standard methods, in *Manilkara*, often leading to poor data quality. In contrast to the chloroplast markers tested, the nuclear ribosomal internal transcribed spacers (nrITS), were found to possess good phylogenetic resolution in *Manilkara*, successfully separating all species examined. The locus was also easy to amplify by PCR and to sequence, which are characteristics of an effective plant barcode. We also evaluated the nuclear ribosomal external transcribed spacer (ETS) in *Manilkara*, and as a potential DNA barcode, found it to possess similar favourable characteristics to ITS. The ETS also possessed less intraspecic variation than the ITS in *Manilkara*. ITS and ETS are therefore good DNA barcodes for Amazonian *Manilkara* species either individually or in combination.

S16.P.06

Discriminating the effects of phylogenetic hypothesis, tree resolution, and clade age estimates on phylogenetic signal measurements

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Understanding how species traits evolved over time is the central question to comprehend the assembly rules that govern the phylogenetic structure of communities. The measurement of phylogenetic signal that describes the tendency of related species to resemble each other more than expected by chance is the first step to comprehend this issue. The different methods available create a difficulty in choosing which of them is the most appropriate. Furthermore, the different phylogenetic tree hypothesis, resolutions and age estimates for many clades can influence the results of these methods. Thus in this study we evaluate to what extent these parameters affect different methods to perform phylogenetic signal analysis, and discuss some pros and cons involved in the choice of a given method in detriment to another. We measured attributes of fruits, seeds, flowering and fruiting phenology of endozoochoric species occurring in Southern Brazilian *Araucaria* forests and evaluated their phylogenetic signal through Mantel tests, phylogenetic eigenvector regression analyses and K statistic. We found contrasting results between the methods; moreover, a better phylogenetic resolution affected all methods tested. There was an evident majority of morphological seed traits with higher values and significant results compared with diaspores traits, while phenological traits were not concordant between the evaluated methods. This work demonstrates that different phylogenetic signal results are obtained depending on the chosen method and the phylogenetic tree resolution, which can lead to opposing conclusions when inferring for phylogenetic niche conservatism or ecological processes determining the phylogenetic community structure. Therefore, testing for phylogenetic signal using more than one single technique, improving the phylogenetic tree resolution and exploring phylogenetic signal patterns across different phylogenetic scales should help interpreting phylogenetic conservatism in species traits.

S16.P.07

Drivers of the ecological and evolutionary structure of tree communities in southern Brazil

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Ecologists have long been concerned about the assembly of ecological communities. Recently, studies conducted in regional and global scale employing evolutionary information to evaluate community structure have improved the ability to understand their assembly. We developed this work based on the scarcity of extensive studies about both the ecological and evolutionary structure of tree communities in southern Brazil. This region encompasses several vegetation types and has a wide variation in climatic variables and elevation. Therefore, we evaluated whether the local community structure of 326 localities was related to environmental filters or to restrictions imposed by the regional species pool. We modeled richness and composition of species and lineages, and phylogenetic clustering as a function of vegetation type, bioclimatic and soil variables, and altitude. Besides, we calculated the frequency of niche shifts for species and lineages among vegetation types and contrasted it to null models. Vegetation type was included in most models, except for phylogenetic clustering, which increased for lower temperatures. Thus, we argue that limitations in the distribution of lineages by regional species pools and climatic niche conservatism drive most of variation in local scale community structure. This idea is reinforced by infrequent niche shifts among vegetation types, showing that colonization depends on the tolerance of species and lineages to environmental conditions. Finally, climatic niche conservatism may also explain the increasing phylogenetic clustering, because few lineages seem to have adapted and occur where climate is more restrictive, providing a process-based framework to explain the assembly of these tree communities.

S16.P.08

Does functional or taxonomic diversity best predict ecosystem functioning in the Brazilian Amazon?

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Statement of purpose: To assess the performance of functional versus taxonomic diversity indices in predicting the quality of Scarabaeinae mediated secondary seed dispersal. This work will encourage movement away from the focus on functional group richness (or guilds) as a surrogate for functional diversity through the use of continuous, functionally relevant traits. Empirical links between functional diversity and ecosystem functioning will be provided to facilitate better understanding of the consequences of species extinctions for the functioning and resilience of natural systems.

First field season methodology: Mesocosms (50x50cm) will be established in primary, secondary and plantation forests in the Jari Forestry landholding, Pará, north-eastern Brazilian Amazon. These will contain mammalian dung and beads (to imitate seeds). Colonisation of either diurnal or nocturnal beetles will be encouraged prior to the closure of the mesocosms. These will remain undisturbed for 7 days to allow full processing of the dung. Destructive sampling in 1cm layers to a maximum depth of 50cm will allow recovery of both beads and the beetles responsible for the function performed. The range of bead burial depths will be correlated to the functional diversity, taxonomic diversity and mean trait values of the beetle community recovered.

Second field season methodology: Similar to above but using real seeds and subjecting the system to drought of various intensities. This will allow assessment of the impact of functional diversity on ecosystem resilience to environmental perturbations.

Results/conclusions: I am about to commence my first field season and as such currently unable to present results.

S16.P.09

Functional and phylogenetic turnover of tree assemblages on fine spatial scale in Atlantic forests

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Niche differentiation is thought to be an important mechanism of species coexistence in tropical forests. Considering that the functional traits are surrogates of general aspects of niche, a high functional turnover of species assemblages across environmental gradients could indicate an important role of habitat partitioning in species assembly. The Atlantic forest was chosen to evaluate the habitat partitioning among tree species on small spatial scale along a topographic gradient. We examined the functional, phylogenetic and floristic similarity of tree assemblages in two distinct vegetation types, southeastern Brazil - a rain forest and a seasonal forest. We measured six soft traits for each species: leaf area, blade type (simple or compound), margin type (toothed or entire), venation (brochidodromous or non-brochidromous), toughness (membranaceous or coriaceous) and the mean height. We constructed a functional and a phylogenetic dendrogram for all species. We sought correlations between topographic differences and both functional and phylogenetic similarity among all pair of plots, with Mantel tests. We compared both functional and phylogenetic similarity to floristic similarity, while controlling the effect of microtopographic variation with ANCOVAs. We also described the fine spatial structure of the functional, phylogenetic and floristic composition of plots, with Mantel spatial correlograms. We found that the overall similarity among tree assemblages decrease with the increase of the topographic difference among plots. The functional and phylogenetic turnover was similar to floristic turnover in both forests. However, the functional, phylogenetic and floristic compositions of plots were spatially autocorrelated. The similarity values were consequently higher among close plots than among distant plots. Our results support that microtopography plays an important role in the species turnover of tropical forests. However, on small spatial scales, the tree assemblages were very similar. Thus, the habitat partitioning among Atlantic forest trees is not finely grained.

S16.P.10

The interspecific abundance-body size relationship in Neotropical butterflies (Nymphalidae: Ithomiini)

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Body size is a fundamental property of organisms that has frequently been shown to be negatively related to abundance. Studies investigating this relationship are often conducted at very large spatial and taxonomic scales: measures of abundance are collated from the literature and compared with metrics of body size for very large assemblages of species. However, such abundance measures are often 'maximum population densities' recorded from areas where species are relatively common and thus easy to study. In real communities, species do not always coexist at these reported densities, making results from such studies difficult to interpret. Comparatively little work has examined the size-abundance relationship within local communities, and these studies often yield very different results. I recently tested the size-abundance relationship in a diverse community of Neotropical insects: clearwing butterflies. I found a weak, negative relationship using double log-transformed measures of butterfly body size and measures of mean local density gathered from five rainforest sites in eastern Ecuador. However, inspection of arithmetic plots suggests that the relationship may be, in fact, triangular, with butterfly species of intermediate body size attaining peak abundance in the local community. I discuss the implications of these findings, as well as directions for future research to explore the mechanistic underpinnings of the interspecific relationship between body size and abundance in Neotropical butterflies.

S16.P.11

Spatial Distribution of Scarabaeinae Related to Vegetation Structure

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Forest fragments are a mosaic of different successional stages. Thus the knowledge of the influence in the fauna by this heterogeneity is an important tool for management politics. This study aimed to evaluate the Scarabeinae (Coleoptera: Scarabaeidae) fauna response to heterogeneity of vegetation and which environmental variables drive it distribution. We conducted the study in an Atlantic Forest fragment in a *Cerrado* (Brazilian Southeast Savanna) matrix. We installed 33 pitfall traps baited with 30 g of human dung. The traps were installed at a distance of 30 m between each trap, in three transects from the edge to the interior of the fragment, distant 50 m each one. We took photographs of the canopy and measured the height of the trees, circumference at the chest height (CCH), number of tree species and individuals, in a diameter of six meters from each trap. Abundance and richness showed negative relation through the "F" test ($F_{1,31}$ = 9.4768 , p = 0.00433; $F_{1,31}$ = 7.9148, p = 0.00844, respectively). The regression tree pointed for abundance of 18.67, 34.20 and 44.07 individuals for trees smaller than 8.4 m, higher than 10.61 m and in this range, respectively. We founded a mean of 4.6 species for a canopy opening higher than 17.57%, a mean of 6.22 species for opening smaller than 15.21% and, in this range, a mean of 7.8 species. Our results shows that the punctual variation of vegetation is important for distribution of species and the opening canopy is the most important for Scarabainae beetles, showing a negative relation with the diversity. Through the regression tree is possible to observe that the most abundant and richness are in the points of the intermediated plants height and opening canopy, what can be related with the maintenance of diversity by the natural intermediate disturbance.

S16.P.12

STRUCTURE AND COMPOSITION OF THE EDAPHIC ARTHROPOD COMMUNITY AND ITS USE AS BIOINDICATORS IN DIFFERENT LAND USE SYSTEMS

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Our study aimed to analyze possible differences in the structure and composition of arthropod community among different land use systems and to evaluate the influence of the vegetation complexity on the arthropod community. We also identified possible presence of bioindicators in the systems. The study was conducted in the municipal district of Lavras, Minas Gerais, Brazil, in areas of secondary forest, *Eucalyptus* plantation and pasture, where we sampled the arthropods using pitfall traps and evaluated the structure of vegetation. The different land use systems did not present significant differences according to richness and mean abundance of arthropods, however the eucalyptus presented the higher total richness. The systems differed in relation to vegetation structure, which richness of tree species was higher in the forest and the height of trees higher in the eucalyptus. Richness of tree species and the height of trees did not present a relationship with the number of species and with the abundance of arthropods. The systems sustained different communities in relation to the structure and species composition. Pasture was the more simplified and different system in relation to the other environments, probably for being an open and less complex ecosystem. Our results demonstrate how different land use systems exhibit communities that reflect its characteristics, corroborating the evidence that the human impacts are capable of changing the community composition and structure. Our study ensures a starting point to understand arthropod response in the face of different land uses, selecting indicator species and taxonomic groups for each system and providing valid information for the development of conservation strategies.

Key Words: Bioindicators, vegetation complexity, *Eucalyptus*, pasture, diversity.

S16.P.13

Niche partitioning and habitat definition in a neotropical forest: a new detection approach

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The existence of niche partitioning along gradients of soil and topography has been studied in many tropical forests. However, the *a priori* definition of habitats used in most studies may blend habitats which are distinct for species and lead to a failure to detect environmental partitions within pre-defined habitats or habitats which cross the boundaries defined by researchers. Here we use a method to detect habitat restrictions that considers the environment as a continuum, enabling us to determine if true habitats exists (corresponding to many restriction points falling in the same value) or if species are spread along gradients. We used a data base of 489 species comprising herbs, shrubs, palms, lianas and trees, from 72 permanent plots spread over 64 km^2 of a terra-firme forest at Reserva Ducke, Manaus, Brazil. We examined restriction along soil texture gradient, the main predictor of community structure at this site. Around 38% of the species were significantly restricted along the soil gradient. The proportion of restricted species ranged from 21 to 77 % between biological groups. Restriction values were strongly clustered at 5-15% of clay content, and two other smaller clusters occurred at 20-25% and 40-45%. The first cluster can be interpreted as a partition between stream margins' environment, and all the rest of the topography; the second as a partition between valley and upland; and the third as a partition between slope+valleys and uplands. These habitats do not agree with the classical valley, slope, plateau division used to describe species associations in many tropical forests. Since habitats overlap, niche partition is smaller than if the three classical habitats existed. The use of habitats based on the human classification for conservation and management may be misleading, and an effort to detect if true habitats exist should be based on environmental gradients.

S16.P.14

Integrating metacommunity processes with biogeography in the study of latitudinal gradients

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Metacommunity theory shows the importance of linking local and regional communities by dispersal of potential interacting species. Although recent studies have tested the relative importance of dispersal- and niche-based processes to regional and local communities, no empirical study has extended this approach to the scale of the latitudinal gradient, as well as comparing among groups with different dispersal capabilities. We tested the relationship between regional and local richness, and investigated whether plant traits, climate and the latitudinal gradient affect the composition of both local and regional communities. We sampled vegetation-living spiders in 12 localities in a consistent vegetation type along 2200 km of the Brazilian coast. We sampled lepidopterans and spiders in architecturally distinct plants in each locality and compared their species composition within localities and along the latitudinal gradient. We evaluated the relationship between local and regional richness along the latitudinal gradient, and used Redundancy analysis coupled with Variation Partitioning analysis to estimate the contribution of plant traits and spatial variation to species composition at both local and latitudinal scales. We showed that at the latitudinal scale only geographical distance explained the variation in the species composition of lepidopterans and spiders. The regional species pool of both groups affected their local metacommunities positively and linearly. However, at the local scale, only plant traits explained the variation in the species composition. We found smaller explained spatial variation for lepidopterans in localities with high temperature variability and higher spider endemism in climatically stable localities. Although both arthropod communities are unsaturated, we showed that this pattern does not necessarily indicate that local communities are non-interactive. We successfully combined metacommunity processes with biogeography to improve our understanding of the scale dependence of processes such as dispersal and its association with speciation, and the association of dispersal with niche-based explanations and ecological drift.

S16.P.15

Distribution patterns of floristic composition in relation to soil gradient in the Central Amazon, Amazonas, Brazil.

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Spatial variation in communities composition is still poorly understood in the different scales. Even in small scales the heterogeneity of habitats is high, and the relation between species and environmental gradients could be one possible mechanism for maintaining the huge diversity. This study was carried out to evaluate the relationship of biological communities and soil gradient. The differences in floristic composition along an environmental soil gradient were evaluated in 5 hectares of relatively undisturbed forest in Central Amazon, located at the Experimental Station of the National Institute of Amazonian Research, ZF2. Data were collected considering tree diameter close to 10 cm at breast height (DBH). The inventory plots covered a soil texture gradient ranging from 6% to 85% of sand and clay varying from 1 to 78 percent. The tree community is composed of 710 species distributed in 222 genus and 52 families. The relationship between floristic composition, summarized by NMDS ordinations, and soil as a predictor, summarized by PCA, was analyzed with multivariate regressions. The soil gradient represented by texture and fertility was a good predictor of floristic composition, explaining 71% in data variation. Most species occurred along the continue gradient, indicating habitat generalists. However we observed niche differentiation with some species only restricted to clay or sand content plots. Those differences are associated with specific habitat types which could result from specialization for specific areas along this continuous soil gradient. This relation supports the deterministic theory that environmental heterogeneity is the main cause for the gradual replacement of species, suggesting a structure for niches.

S16.P.16

Fine-scale environmental variation drives harvestmen (Opiliones) diversity patterns

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Few studies have tested the influence of physical factors to the spatial distribution of harvestmen (Arthropoda, Arachnida, Opiliones). We tested whether environmental variation influences diversity patterns of harvestmen in a Neotropical forest at Reserva Biológica Augustu Ruschi, Southeastern Brazil. We hypothesized that harvestmen diversity patterns will respond to fine-scale environmental variation. We sampled harvestmen in seven areas distant on average 3.8 km (range = 0.52 – 7.87 km) from each other. Within each area, we collected harvestmen in six plots of 150 m^2 (30 x 5 m) and measured the following environmental variables: air temperature and humidity, number of fallen trunks and leaf litter height (i.e., mean height of leaf litter in 1 m^2 within each plot). We collected 898 individuals from 39 harvestman species. We showed that air temperature had a negative effect on harvestmen richness, while leaf litter height had a negative effect on harvestmen abundance. These two variables have also affected harvestmen species composition. This suggests that physiological restrictions of harvestmen (e.g., the propensity for dehydration) influencing their spatial distribution in fine-scales. Indeed, an increase of 3 ºC diminished on average one harvestman species; however, an increase of 1 cm of leaf litter diminished on average four harvestman individuals. Seventy four percent of the species occurred only in temperatures below the mean temperature (18.5 ºC), and 69% of species in areas with leaf litter below the height of 4.2 cm. Our results suggest that even fine-scale spatial variation in environmental variables affects harvestmen diversity patterns. This result indicates that harvestmen could be important focal taxa for future studies in ecology and conservation biology. For instance, they can serve as indicators of disturbance in tropical forest, since high temperatures have drastic negative effect on their survival.

S16.P.17

Spatial patterns on functional diversity of African mammals

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Spatial variation in biological diversity is a main subject in biogeography since its establishment as a science, but all knowledge regarding this subject is based on species richness as the diversity measurement. Alternative metrics that take into account biological processes may provide good insights regarding the mechanisms of species diversification and reveal patterns that are not readily available by species richness. The objective of this study was to describe the spatial variation of two diversity measurements that reflect ecological processes (functional diversity and functional distinctness) and contrast them with the spatial patterns reported to species richness. To accomplish this, we assembled a database on 868 terrestrial mammal species regarding its geographic distribution on continental Africa (2402 hexagonal cells, 121 km² each) and its ecological traits. The species richness was defined as the number of species on each cell and functional diversity and distinctness were estimated based on functional attributes matrixes assembled. Functional diversity is higher on the eastern part of African continent and decreases towards the Sahara, similar to the pattern observed on species richness. Functional distinctness, on the other hand, is higher on the southern part of the continent and attains its lowest values at the borders of Sahara, but it does not present a clear spatial pattern and it is not related to the variation in species richness. The is no clear relationship between functional distinctness and species richness, as was observed in the American continent and environmental factors must be taken into account to understand its spatial patterns.

S16.P.18

Species richness vs. phylogenetic diversity: assessing the conservation needs of the Didymopanx group of Scheffera (Araliaceae)

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Biodiversity assessments based solely on species counts do not consider their degree of distinctiveness, and may not be the best criterium for conservation. Molecular phylogenies can be a source of genotypic information among related species, and thus provide an important but often ignored component to biodiversity assessments. We present here an attempt to compare species richness (SR) and phylogenetic diversity (PD) for biodiversity assessment using the Didymopanax group of Neotropical *Schefflera* (Araliaceae), a clade that is largely restricted to South America east of the Andes. To calculate SR, a data base of 1,460 specimes from 40 species of this group was assembled and mapped onto 1 x 1° grid map of South America, measuring the richness of each quadrat with at least one sample. To measure PD, a maximum likelihood (ML) phylogeny based on three nuclear molecular markers (ITS, ETS and 5S-NTS) was assembled from 35 species of the same group. Five species were missing from this analysis. Phylogenetic diversity for each quadrat with two or more species was estimated from the sum of branch lengths among species in the ML tree. Species richness and phylogenetic diversity did not select the same priority areas for the maximum conservation of Didymopanax species. The quadrats with the greatest species richness were located in the Espinhaço Range at Minas Gerais and southeastern Brazilian Atlantic forests. Nine of the ten most phylogenetically diverse quadrats were in the Amazon, the only exception being a high PD Atlantic Forest quadrat. The Espinhaço Range in Minas Gerais harbour several closely related species, but these areas have low PD. Amazonian quadrats had low richness, but high PD due to the contribution of phylogenetically distant species. We suggest that both of these approaches to biodiversity assessment should be considered together to maximize the conservation of Didymopanax in South America.

S17.OC.01

Spatial and temporal variability of plant-available soil water in Congo Basin and its relationship with tree species distributions

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Regional-scale patterns of tropical rainforest tree composition can be due to climate (rainfall, dry season length), geology and/or soil properties (chemical fertility, available water). In Amazonia, soil fertility and dry season length appears to be the main factor to explain this pattern. However, in the Congo Basin, geology has been proposed to explain the pattern of some commercial timber species. Since the geological substrates of this area have similar chemical properties, we hypothesized that this pattern could be explained by the plant-available soil water (PAW).

We used a soil water balance model similar to RisQue in the Congo Basin over the period from 2000 to 2010, with a decade time step, and with a spatial resolution of 8 km. The input parameters of this model were the maximum plant-available soil water (PAWmax), rainfall and evapotranspiration. The output parameter was the maximum number of successive decades when PAW was null, named extreme drought index (EDI). Finally we carried out a map of EDI at Congo Basin scale that we compared with maps of the spatial pattern of 31 commercial species.

We showed that Arenosols, as expected, but also other soils like Ferralsols, have the lowest PAWmax of the Congo Basin. We evidenced no or low correlations between the map of EDI and maps of the spatial pattern of each of the 31 commercial species. Other factors, not taken into account in this study, might explain this result like the water table level and variable forest rooting depth in function of soil type.

S17.OC.02

Drought resistance of tree species in the Congo Basin: interspecific variation of seedling responses and traits.

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Tropical Forests are projected to experience changes in precipitation patterns with global climate change. As water availability is known to influence species distribution patterns, ecological data on drought resistance of species are a prerequisite to understand, why and where tree species will persist in these landscapes. Impacts of drought on Neotropical forest have been widely documented in the last decades while Central African forest remained poorly studied. A pronounced drying trend in the Congo basin, which constitutes the driest tropical rain forest region, makes the understanding of interspecific variability of responses to drought a priority in this area. This study was conducted within the framework of the CoForChange project (Eranet-Biodiversa) with main objectives to (1) quantify the variation of seedlings drought resistance among a large number of tree species (2) identify morphological and/or physiological traits underlying these variations and (3) test for potential trade-offs among traits shaping drought resistance and shade tolerance. Results of three experiments conducted in Pointe-Noire (Republic of Congo) are presented here. Seedlings of 38 tree species in the Congo basin had high survival rates even under severe drought conditions. The relationships among more than 20 traits and drought resistance were explored and a PCA showed that high desiccation tolerance, associated with high stem density and low water loss from transpiration are especially important for variation of drought resistance in these species. This study provides the first step for linking drought resistance and shade tolerance, as well as the underlying traits, to species distribution in the Congo basin.

S17.OC.03

Effects of drought on species composition and distribution of tropical forests in West Africa and Bolivia; the underlying mechanisms

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Rainfall and plant water availability are the main drivers of large-scale gradients in species richness, composition and distribution of tropical lowland forests. We use forest inventory data (>180 sites) and botanical data from West Africa (Sierra Leone to Ghana), and data from 220 1-ha plots in Bolivia, to show that climate is a much more important driver than soils. Results of a comparative dry-down experiment with Bolivian tree species indicate that the ability of tropical tree species to survive prolonged periods of drought is related to drought avoidance (deciduous leaf habit), and water storage in the taproot. For evergreen species drought survival is positively related to wood density and cavitation resistance. Using an ecophysiological model, we show that species' functional traits shape the whole-plant water compensation point. Species variation in water compensation point allows for local coexistence in a tropical dry forest, and predicts species distribution across large-scale gradients in water availability. Future climate change and increased drought may therefore have local effects on species coexistence, and regional effects on species distribution.

S17.OC.04

Environmental filtering and species distributions across lowland South American forests

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In the Amazon, projections of climate change forecast increasing frequency or severity of drought. Predicting the consequences of these changes will require improved understanding of how tree species distributions are constrained by environmental conditions.
We conducted a reciprocal transplant experiment of tree seedlings across the three most common lowland forest habitats of tropical South America that represent contrasting conditions of soil water availability and fertility: terra firme forests on clay-rich soils, seasonally-flooded forests and white-sand forests. To test the generality of plant response to environmental changes, we replicated the experiment in two contrasting regions, north-eastern Peru and French Guiana, that well represent the broad seasonality and soil fertility gradients from the western Amazon (no annual dry season, fertile clay soils) to the Guianas (well-established dry season, infertile eroded clays). We focused on seven tree lineages that are distributed across Amazonia and that include specialists to each of the three habitats. We chose 37 focal species based on their distributions across 74 0.5-ha plots established in the three habitats within ca. 50,000 km2 in both north-eastern Peru and French Guiana.
We tested for differences in seedling performance in terms of survival and growth across the habitat gradient and among lineages. Seedling survival was high in all three habitats, but in general habitat specialists survived best in their habitat of origin. This pattern was consistent in both regions but showed variations among lineages. Seedling growth was generally higher in terra firme and seasonally-flooded forests than in white-sand forests. The pattern was stronger in Peru than in French Guiana, and varied among lineages. Our results confirm strong patterns of environmental filtering and habitat specialization in Amazonian trees and portend potential shifts in floristic composition under scenarios of climate change.

S17.OC.05

Determinants of tree distribution in tropical forests: assessing the impact of dry season intensity and soil species by species

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Understanding which factors shape species distributions, community composition and ecosystem function in tropical forests is one of the most pressing issues in global change vegetation modelling. There has been a long-term interest in how climate and nutrients, especially phosphorus, limit tropical forests, however, to date little robust information on the relative importance of the various factors is available.
We analysed the distribution of 556 tree species in response to dry season intensity and eight soil chemical properties across the Isthmus of Panama, an area that exhibits a strong rainfall gradient and a high diversity of soils. The analysis is based on rainfall data, extensive soil analyses, and tree inventories at 72 sites within about 650 km^2. We show that dry season intensity and phosphorus are the strongest drivers of distribution patterns of individual species, and community-wide these two factors affected the highest percentage of species: over 50% of the species responded substantially to each. Individual species showed a wide variation of distribution patterns with respect to moisture and phosphorus. Some species responded to calcium, but other nutrients had little impact.
This is the first time the importance of individual edaphic factors for regional scale tree distribution patterns has been conclusively assessed both at the species level and across the entire community. The results underline the importance of incorporating both dry season intensity and phosphorus into models predicting species distribution, community composition and ecosystem function of tropical forests under global change scenarios.

S17.OC.06

Drought-induced shifts in the floristic and functional composition of tropical forests in Ghana

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Tropical forests are globally important stores of both terrestrial biodiversity and carbon but face a wide range of threats. Understanding how biodiversity and carbon cycling will be affected by global environmental change is a key research challenge, particularly due the risk of increased drought. The majority of studies concerning drought impacts on tropical forests focus on extreme El Niño related events in Neotropical and Asian forests and which are associated with large increases in tree mortality and biomass loss. The African continent contains substantial areas of tropical forests, some of which have experienced significantly drier climates at the end of the twentieth century. Despite this, little research has attempted to assess the impacts of drought on African forests.
West Africa has experienced long-term drought since the 1970s, and in the forest zone of Ghana mean annual precipitation has decreased on average by 165 mm compared with pre-1970 rainfall. Here we assess decadal-scale changes in plant functional composition (including drought tolerance, leafing phenology, successional guild, canopy position and wood density) and biomass in 19, one ha permanent sample plots along a rainfall gradient in Ghana. We use a bootstrapping approach to assess plot-level and species-level changes in functional traits during a drought period. Monitoring forest plots from 1990 to 2010 we find a consistent increase in dry forest, deciduous, canopy species with intermediate light demand, yet an increase in biomass. These results suggest that, by altering composition in favour of drought tolerant trees, forest biomass stocks may be more resilient to periods of reduced rainfall than previously thought. These results contrast with those from short-term extreme droughts, and highlight the importance of studying a broad range of drought strengths in order to understand and predict the responses of tropical forests to a changing climate.

S17.OC.07

Impacts of long-term experimental drought on the physiology and ecology of an eastern Amazon rain forest

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We report results from a long-term large-scale rainfall exclusion experiment in eastern Amazonia. Experimental partial throughfall exclusion was initiated at Caxiuana National Forest Reserve, Para State, Brazil, in 2001 using 1 ha plots. To our knowledge, this is the longest running experiment of its kind in the tropics. We have measured the response to the imposed soil moisture deficit in multiple components of the forest ecosystem: growth and mortality of individual trees; LAI and root growth; water use by trees; respiration in soil, roots, stems, leaves and coarse woody debris, and photosynthesis. Our component-scale process measurements show strong short-term reductions in soil respiration and water use by trees, longer-term responses in autotrophic respiration, and substantial tree mortality following initial resistance to drought. There is multi-component evidence for increased autotrophic respiration following extended drought. Combined with the impacts of extended drought on tree mortality, the effect is a substantial impact on estimated net ecosystem productivity. We have successfully modelled the response to drought at high resolution and over short timescales; coarser-scale modelling suggests a clear need to improve key ecophysiological model constraints using data from the experiment.

S17.OC.08

Investigating and predicting the long-term effect of drought on the demography of tree species in Central Africa.

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A matrix transition model for size-structured populations was built to predict the climate-induced changes of a Central African tropical rain forest. The forest, located near the city of M'Baïki in the Central African Republic, has been monitored since 1982. To deal with species diversity, species were assigned to species groups depending on their recruitment, growth and mortality response to environmental factors. Future climate till 2100 was simulated along three contrasted scenarios: drier climate, wetter climate, or 'no change' climate. Species were found to be ordered along a drought tolerance gradient, and the forest response to climate was driven by this drought tolerance acting as a filter on species. Hence, under the drier climate scenario, drought sensitive species were less abundant than under the 'no change' scenario, whereas drought tolerant and drought insensitive species were more abundant. Matrix modelling was found useful to explore climate-induced forest changes, taking account of tree demography. This type of model seems complementary to other modelling approaches to forecast the impact of climate on forests, such as dynamic vegetation models, habitat models, or gap models.

S17.OC.09

Towards trait-based mortality models for tropical forests?

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Global change and associated increases in the frequency, duration and/or severity of drought events could fundamentally affect tropical forest dynamics. In this context, modeling the effects of climate warming on tropical forest dynamics poses an urgent scientific challenge. Models of tropical forest dynamics basically involve three ecological processes: recruitment, growth and mortality. In this study, we focused on tree mortality, a key but understudied process.

We developed a model of tree mortality, working at the community scale, using 20-years of forest dynamics data from a neotropical forest in French Guiana. The model computes individual probabilities of tree death using functional traits as covariables in a generalized linear model. The functional traits are proxies of tree ecological strategies and offer furthermore a way to solve problems linked to over-parameterization in highly-diverse communities. Covariables were selected and parameters were estimated in a Bayesian framework

We found that mortality is strongly linked to the ontogenetic status of individual trees, with a typical U-shape curve of death probability with age. We describe a suite of functional traits (e.g. wood density, maximum size etc...) that shape the individual curves.

Our modeling approach offers a promising way to predict mortality in species-rich communities with little parameter inflation, bridging the gap between functional ecology and population demography.

S17.OC.10

Which climate indices are relevant for predicting the response of tropical forests to future climate scenarios ?

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Climate models predict a range of changes in the amazonian region, including increased frequency of extreme climatic events, increased average temperatures, increased atmospheric CO_2 and reduced rainfall intensity.
Understanding tree growth response to climate is important because wood production is the main way carbon enters the forest ecosystem. The response of tropical tree growth to changing climate could drive a change in the direction of the flux from terrestrial ecosystems to the atmosphere.
The last 20 years has seen a substantial increase in the number of publications with a focus on the effects of climate on tropical tree growth. Citation reports extracted from the Web of Science with the keywords ‘climate’, ‘tropical forest’, ‘growth’ and ‘trees’ found only 15 articles in 2000 and more than 70 in 2011. These articles are based mostly on modelling approaches combining tree growth and one or more climate indices.
We review the different approaches used in order to, (i) identify gaps in current research, (ii) determine which climate index is the most relevant for a range of temporal and spatial scales and (iii) establish which climate indices are the most appropriate to study tropical tree growth in regards to the climate output of the IPCC scenarios.

S17.OC.11

The response of dead wood respiration to seasonal drought in a neo-tropical forest.

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Coarse woody debris (CWD, dead wood ≥ 10cm diameter) is a large storage of carbon in tropical forests. Carbon loss from CWD occurs because of heterotrophic respiration from multiple decomposer types acting in different time scales with different environmental responses. This complexity has caused the total flux and seasonal response of CWD respiration (Rcwd) to remain poorly studied in tropical forests. In the context of predicted future drought and mortality increases in Amazonian forests, the omission of a CWD pool from land surface models is a major constraint on understanding future shifts in the forest carbon balance. This study presents a four month time series of Rcwd measurements during the transition into and out of the intense dry season at the Paracou forest in the French Guiana. A Perspex chamber, connected to an infrared gas analyser (PP Systems, EGM4) was sealed to a fixed measurement point on the surface of 42 samples of CWD. Rcwd measurements were repeated 13 times on each sample from July to November 2011. Wood moisture, temperature, chemistry, age, species, wood specific gravity (WSG), and meteorological data were used to investigate the biotic and abiotic controls on the magnitude and seasonal response of Rcwd. Results show Rcwd fluxes are 2.21±0.35 Mg C ha yr^{-1}, 6.17% of estimated ecosystem respiration. The magnitude of CWD respiration is controlled by wood moisture, long term decay status and WSG. Seasonal drought causes a reduction in forest CWD carbon flux of 34%. Seasonal change in CWD respiration is significantly correlated with wood moisture and below canopy air humidity but not with wood temperature. We conclude that CWD is an important carbon flux and it has a stronger seasonal response to moisture availability than to temperature.

S17.OC.12

Identification of areas susceptible to desertification in Caatinga using Landsat images

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The Caatinga biome in the semi-arid region of northeast Brazil is susceptible to desertification (complete bare soil). Remote sensing classification of its vegetation in a landscape scale is an important device to identify desertification susceptibility. Supervised classification like Maximum Likelihood (ML) is broadly used to classify satellite's images but some studies have shown that semi-arid regions are better classified by using Linear Mixing Model (LMM). This study investigates if LMM can improve the accuracy of the ML vegetation classification providing better identification of susceptible areas to desertification in Caatinga. The ML classification was carried out using three classes of Caatinga vegetation in a Landsat TM image (July 2005) and in a LMM image. The accuracy was verified in a high resolution image (Quick Bird, February 2005) which was used to estimate the percentage of bare soil inside 116 random plots in Ponta do Tubarão Conservation Unit, Rio Grande do Norte, Brazil. Classes of Caatinga vegetation from Quick Bird were predefined according to % bare soil: open (>40%), intermediate (10-40%) and covered vegetation (<10%). The assurance was 57.76% and 52.59% to ML and LMM, respectively. The difference between Vegetation Fraction Image (VFI) from LMM and the Normalized Difference Vegetation Index (NDVI) from Landsat TM were analyzed by linear regressions with bare soil percentage. The NDVI had a negative relationship with bare soil ($t=-3.278$; $p=0.00132$) while the VFI had positive one ($t= 2.362$; $p=0.0195$). Most likely the presence of herbaceous plants (low % bare soil) at the rainy season may have influenced the low values in VFI (ranging from 0.17-0.57). As a result both methods were not able to provide reliable vegetation classification in the Caatinga biome using Landsat images from rainy season. Tests to identify changes in vegetation cover in semi-arid areas must be performed using Landsat images from dry season.

S18.OC.01

Tree transpiration in tropical forest plantations: effects of species, seasonality and diversity

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Tropical tree plantations are increasingly important to meet the global demand for wood, but are blamed for unsustainable high water use rates. New approaches recommend the establishment of mixed species plantations preferable with native tree species, but few studies have compared water use in monospecific vs. mixed stands. Our objectives were to (1) compare water use characteristics among tree species with different seasonal pattern in leaf phenology and to (2) identify the role of tree diversity in controlling water use efficiency in tropical tree plantations. Sap flux was monitored with thermal dissipation probes in 76 trees belonging to nine tree species for 1 year in a 15-year-old commercial and a 7-year-old experimental tree plantations in Panama. Measurements were performed in trees growing in monocultures, two-species mixtures, three-species mixtures and five-species mixtures. Tree water use, tree transpiration, stand transpiration rates and water use efficiency were estimated. Species means of maximum tree transpiration rates varied more than twofold (1.2–2.8 mm day^{-1}) for trees growing in monocultures. Tree transpiration rates between the dry and wet seasons differed for six of the nine species due to changes in leaf area. Trees growing in mixtures had larger diameters, conductive sapwood and basal area than those in monocultures and accordingly higher water use rates. Mixed species stands, containing five tree species, maintained high stand transpiration rates even during the dry season and the water use efficiency (2.1 g DM kg^{-1} H_2O) was about half that of either monocultures, two- or three-species mixtures . The high stand transpiration rates in the five-species plots may be caused by higher vegetation-atmosphere-energy exchange and⁄or complementary use of soil water resources. In conclusion, species selection and consideration of species richness and composition is crucial in the design of tropical plantations to maximize wood production while avoiding soil water depletion.

S18.OC.02

The role of internal water sources in regulating the water balance of woody plants

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Even under non-extreme environmental conditions, plants are exposed to the potential risk of catastrophic xylem failure unless different mechanisms act to avoid the loss of hydraulic function. In response to dynamic environmental conditions trees have evolved to have a suite of morpho-physiological traits that mitigate hydraulic resistance limitation to sap flow, which include the capacitive discharge of water from internal tissues. Components of the plant water transport pathway – roots, trunks, branches and leaves – can also serve as water storage compartments and therefore act transiently as intermediate sources of water for transpiring leaves. The relative contribution of stored water (mainly in stems) to total daily transpirational losses has been estimated in several species and varies widely, ranging from 10% to 50% among different tree species and ecosystems. Although absolute daily reliance on stored water increase with the tree size in a similar manner across diverse species regardless of whether they are angiosperms or conifers or whether they are tropical or temperate, the relative contribution of stored water to daily water use does not exhibit an universal scaling with tree size, probably as consequence of the strong dependence of stored water use on environmental conditions and the fact that water storage capacity is a non-intrinsic property. In trees, reliance on stored water to temporarily replace transpirational losses is an important homeostatic mechanism, constraining leaf water deficits and maintaining gas exchange. In this talk we will focalize on the underappreciated role that internal water storage plays in stabilizing the physiological function of trees under the dynamic conditions that prevail over the course of a day and between seasons.

S18.OC.03

A continuum in phenology, photosynthesis, and water relations of seasonally dry tropical forest trees in Santa Rosa, Costa Rica.

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Phenological continuity among SDTF tree species was quantified and related to climatic seasonality and water relations in Santa Rosa, Costa Rica. Diversity in leaf longevity was reduced (218-311 days) but phenology and water relations were highly diverse. Small variations in leaf longevity and high diversity in key structural and functional traits produced a continuum in leafing patterns and canopy duration. Asynchronies in within-crown and among-tree phenology, and in the timing of dry-season flushing, were responsible for phenological continuity. Phase-changes occurred rapidly and in sequence, mostly during the dry season, and were not always responsive to actual climatic conditions. The capacity to reproduce during drought also differed among trees. Fruit failure was common. Annual variations in water relations and tree water use were also substantial and reflected phenological continuity. The time course of photosynthesis and nutrient retrieval during leaf life span also varied continuously, so that leaf physiology does not predict leaf habit. We conclude that deciduous trees may be opportunistic that take advantage of transient, favorable conditions to out-compete shortly-deciduous and evergreen trees, but their growth declines as drought sets in. Co-existence of diverse phenologies may be permitted by seasonal changes in resource partitioning among trees and non-linear competition throughout the year.

S18.OC.04

Seasonal cycles of leaf desiccation and rehydration of a vascular resurrection plant under contrasting water availabilities at the brazilian 'Campos Rupestres'

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Desiccation-tolerant vascular plants (also known as 'resurrection' plants) represent a major functional group in the 'Campos rupestres' (rock outcrops) of central Brazil, characterized climatically by pronounced seasonal droughts. Leaves of desiccation tolerance plants can equilibrate its internal water potential with the dry air, and return the normal metabolism after rehydration. Climate change scenarios predict drier and hotter climates for this region but we still lack a thorough understanding of species response to extreme droughts. The aim of this study was to investigate the dynamics of leaf desiccation and rehydration of a resurrection plant species (*Vellozia* sp.) across a broad range of water regimes. The study was carried out in a rock-outcrop field at the "Serra da Canastra National Park" during 15 months. We set four rainfall exclusion plots (4x4m) and two control plots, where we monitored leaf phenology (monthly), gas exchange and water potential (quaterly) of 41 individuals. The relative amount of desiccated leaves reached 76.6% during the natural seasonal drought and peaked 96.4% under severe drought conditions. Stomatal conductance (gs) was significantly reduced in the remaining leaves in both conditions (gs mean in rainy season=0.6±0.1 $\mu mol.m^{-2}s^{-1}$/ gs mean in dry season=0.16±0.1 $\mu mol.m^{-2}s^{-1}$). With the onset of the rainy season, the water table level reached the surface in all plots and 85% of the desiccated leaves rehydrated and became photosynthetically active. The timing and magnitude of leaf desiccation and dehydration in the population were strongly associated with superficial soil water potential (estimated from pre-dawn leaf water potentials). We predicted that severe droughts will increase the proportion of desiccated leaves of *Vellozia* sp., while prolonged droughts will decrease the windows of opportunity for carbon gain in annual basis. Both types of drought may lead to increases in plant mortality caused by carbon starvation for this species.

S18.OC.05

Morphological and ecophysiological adaptations of the African baobab (Adansonia digitata L.) to drought

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The African baobab tree (*Adansonia digitata* L.) has been identified as one of the most important multi-purpose tree species of the semi-arid regions of Africa. Although seasonal drought is one of the major constraints for plant growth and survival in these regions, little has been reported about the mechanisms baobab trees use to deal with drought conditions. Here, we aimed at giving an overview of the morphological and ecophysiological drought-coping mechanisms of the species. Geographical variation in baobab leaf, fruit and seed morphology was assessed across the species' distribution range in western Africa, and greenhouse experiments were carried out in order to investigate seedling biomass allocation patterns and drought responses in relation to rainfall at seed collection site.

Baobab trees exhibited a large morphological variation across western Africa, which could be related to environmental conditions. For example, drought-adapted leaves (which were small and had a high stomatal density and specific leaf area) were formed in drought-prone areas, while baobab trees in dry regions produced fruits with a larger seed fraction and a higher number of seeds than trees from more mesic areas. Although these relationships might be the result of both phenotypic plasticity and genotypic adaptation, greenhouse experiments evidenced that baobab seedlings are genotypically adapted to their surroundings. Under well-watered conditions, for example, seedlings from dry seed collection sites invested relatively more biomass in their root system and had higher tissue water contents than seedlings from more mesic sites. A greenhouse experiment revealed that baobab seedlings use mainly drought-avoidance mechanisms under soil drought (tight control over stomatal water losses, shedding of leaves, …), although some drought-adapted leaves were also formed. Due to a number of mechanisms, seedlings from dry localities seem to be better adapted to drought than seedlings from wetter study sites. The observed differences in drought responses point towards genotypic adaptation, and there is thus room for the selection of superior, drought-tolerant plant material.

S18.OC.06

Water relations and hydraulic architecture of evergreen and deciduous tree species with different wood density: the effect of a severe dry spell in the semideciduous Atlantic Forest

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The wood density is an important attribute for understanding the physiology and ecological behavior of trees. It is functionally related to a large number of variables and processes, such as growth rate, water transport and size of the stem water reservoirs. We studied some aspects of the water relations and hydraulic architecture of ten species differing in wood density and phenology from a semideciduous Atlantic Forest in Northern Argentina. Although the study area normally receives an annual precipitation of 2000 mm, unpredictable dry spells may occur during the year. We measured wood density (wd), wood relative water content (RWC), leaf water potential at midday (ψmd) during a severe dry spell in summer, and estimated vulnerability to xylem cavitation (P50) in terminal branches for each species. Stem growth was also measured every two months with band-dendrometers. Species with lower wood density were expected to be more vulnerable to cavitation assuming that there is a trade-off between xylem efficiency and safety. However, we found no relationship between these two characteristics of the hydraulic system. The species with the highest wd (0.86 g cm-3) was also the most vulnerable to cavitation (P50 = -1MPa). There was a negative relationship between ψmd and wd (p=0,0035) indicating that species with lower wd have a more favorable water balance during the day due to the presence of reservoirs of water in their stems. Some species showed a sharp decrease in stem diameter due to the depletion of the internal water storages in the main stem regardless of their wood density and phenology.

S18.P.01

Effect of seasonal water stress in the physiological parameters of different species in the area of environmental remediation

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Climate change and greenhouse gases allow the average temperature increase and redistribution of precipitation of global rain inducing changes in the environment. As a consequence, the decrease in soil moisture can lead to increased periods of drought. The aim of this study was to determined physiological parameters of three different young tree species in the recovery area, in periods of drought and rain. The species studied were *Solanum paniculatum* L., *Croton floribundus* Spreng. and *Croton urucurana* Baill., that are used in areas of recovery. In order to verify the responses of these three species we evaluated physiological parameters such as stomatal conductance, stomatal resistance and leaf and soil water potential. Were evaluated three individuals of each species located in a recovery area belonging to Institute of Biosciences (IB), UNESP - Univ. Estadual Paulista, Botucatu, Sao Paulo, Brazil. The results indicate that the species *S. paniculatum* responds readily to the period of water availability, with a stomatal conductance (g_s) of 435.44 mmol/m² s in the day before of rain for a conductance of 1768.52 mmol/m² s after rainy day. With a increase in stomatal conductance, enhances the entry of CO_2 and influences the photosynthetic rate. Other hand the species *C. floribundus* has resistance and stomatal conductance more stable in both periods compared to other species. However the specie *C. urucurana* has alternations in stomatal conductance in both periods and a marked difference in stomatal resistance between the periods of rainy days. Our results pointed out the importance of response for the survival of these species in this seasonal environment. The different responses between species show alternative strategies to overcome the drought until the availability of water again so regulate your metabolism.

S19.OC.01

Nocturnal transpiration and hydraulic lift: how do they affect hydrological cycles in Neotropical forests and Savannas?

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Two unique processes which have not been thoroughly evaluated in tropical ecosystems: nocturnal transpiration and hydraulic lift may have a substantial impact at the whole ecosystem level. The purpose of this study is to assess and predict the importance and significance of these two processes in Neotropical savannas, seasonally dry forests and rainforests of Latin-America. Nocturnal transpiration was evaluated with leaf level gas exchange and heat dissipation methods. Hydraulic lift was evaluated with heat pulse methods, diurnal variations in soil water potential and the addition of deuterated water to tap roots. Nocturnal transpiration is the water loss by C3 or C4 plants during the nighttime period. Factors that enhance nocturnal water loss in savannas are low vapor pressure deficits and low soil nutrients content. Hydraulic lift is of importance during the dry season when there is a large water potential difference between deeper and shallow soil layers. Water moves up from the deeper soil layers using deep/tap roots and eventually moves back to the soil through shallow roots. Using mathematical models we were able to predict the effect that hydraulic lift have on the soil water status at the end of the dry season. We have ranked the three ecosystems described above in terms of their importance in impacting the water cycle. The amount of ecosystem nocturnal transpiration increases along a gradient of decreasing soil nutrient availability, from high soil nutrient content to oligotrophic soils (seasonally dry forests, rainforests and savannas, respectively). The amount of hydraulically lifted water increases along a gradient of decreasing soil water availability and the patterns of rooting depth from rainforests, to seasonally dry forests to savannas.

S19.OC.02

Temperature response of leaf dark respiration of tropical canopy trees and lianas and its implication for modeling forest responses to climate warming

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Leaf dark respiration (*R*) consumes significant proportion of photosynthetic carbon uptake in plants, but empirical data on *R* and its temperature sensitivity (Q_{10}, the proportional increase in *R* with a 10°C rise in temperature) are scarce for tropical trees and lianas. We quntified *R* and its relationship to leaf temperature for 26 species of tropical trees and lianas in Panama, using a tower crane to access fully exposed, top canopy leaves, using a novel *in-situ* protocol. The results show that respiration standardized at 25°C (R_{25}) was significantly higher for lianas than for trees (14.5 *vs*. 11.3 nmol $g^{-1}s^{-1}$; $P<0.01$), and higher in early successional than late successional species (14.4 vs. 9.0 nmol $g^{-1}s^{-1}$; $P<0.01$). R_{25} values for both trees and lianas were among the highest when compared to published data on tropical canopy leaves. Interspecific variation in R_{25} was best explained by variation in leaf mass per unit area, photosynthetic capacity and foliar content of nitrogen, phosphorus and potassium. Q_{10} values varied widely (range 1.4-3.5), but not systematically among species and PFTs and could not be predicted from other species-level leaf traits. Theoretical models assuming temperature acclimation suggest that Q_{10} values in the tropics to be lower than the often assumed standard of 2.0, but instead we found the mean Q_{10} of trees (2.4) and lianas (2.2) to be significantly higher than 2.0. Thus, published models of carbon fluxes from tropical forests underestimate carbon loss from foliar respiration and underestimate the additional carbon lost with climate warming. More data on temperature responses of *R* for tropical forest ecosystem are urgently needed to adequately predict tropical forest net primary production under the warmer climate conditions predicted in near future.

S19.OC.03

Exploring the role of nutrients in determining the water relations and carbon allocation of woody plants in Neotropical savannas and semi-deciduous forests

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The original areas of tropical savannas and Atlantic forests cover about of 4 million of square kilometers in South-America. These ecosystems are controlled by the interactions among water and nutrient availability and frequency and type of disturbances. Although the role of water availability as a limiting factor, in particular of savanna dynamics, has been relatively well documented, the role of soil nutrients is much less understood. Here we will discuss the effects of long-term fertilizations on water relations, water consumption and growth in woody plants of Cerrado savannas in Brazil and in the forest of North-Eastern Argentine. Typical isohydric behavior and similar rates of water consumption with respect to marked seasonal changes in precipitation in savannas are not maintained when Nitrogen availability is increased by fertilization. Apparently, alleviation of nutrient limitations affects physiological processes and patterns of carbon allocation in trees in a manner that prevents homeostasis in plant water relations. Removal of nutrient limitations by fertilization modifies the pattern of resource allocation which maximizes carbon gain and enhances growth both in savannas and forest trees. In addition, it reduces the vulnerability to water stress induced embolisms, contrary to the general assumption that resistance to cavitation is not a plastic trait and that is mainly achieved at the expense of low growth rate. Our studies indicate that despite being adapted to chronic nutrient limitation, savanna and Atlantic forest trees apparently have the capacity to exploit increases in nutrient availability through architectural as well as physiological changes that allow to maximize the growth but at the same time minimize the risk of hydraulic failure. These consequences of removal of nutrient limitation at plant level may also affect the ecosystem-level hydrological processes by increasing the tree water use and thereby depleting the soil water availability, in particular during the drought period.

S19.OC.04

Trait variation along a broad geographical gradient for widespread neotropical savanna trees

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Quantifying leaf trait relationships across species and across broad geographical ranges can provide information about major dimensions of variation among coexisting species and of constraints to trait variation imposed by selective forces and evolutionary history. In this study we assessed the extent of geographical variation in leaf traits in twelve savanna woody species. Plants were measured in savanna sites located at Assis (22º 37'S, 50º 23'W), Brasilia (15º 57'S, 47º 55'W), Santarém (02° 29'S, 54° 56'W) and Boa Vista (02° 52'N, 60° 43'W), spanning a latitudinal gradient of about 24°. Sites differed in rainfall, soil characteristics and temperature. At each site specific leaf area (SLA), CO_2 assimilation on an area (A_{max}) and mass (A_{mass}) basis, dark respiration (Rd), stomatal conductance (gs) and leaf N, P, K, Ca and Mg were measured in five individuals of each species. The results of a two-factorial MANOVA (locality as a fixed factor and species as a random factor) suggest that the species have different combinations of leaf traits at each location. The results of PCA analysis for each location support these results. Single, significant bivariate relationships were found for N x P, SLA x N and SLA x P and P x A_{mass}, while Ca x Mg differed for Boa Vista and SLA x K for Brasilia in relation to the other localities. In conclusion, in resource-limited neotropical savannas, conflicting allocation of resources tends to constrain the number of possible combinations of functional traits, across a broad geographical range. However, individual species showed large geographical variation for the studied traits.
CNPq, CAPES, DPP-UNB.

S19.OC.05

What natural and manipulative experiments can tell us about distribution and abundance of plants along environmental gradients? The case of the Brazilian Atlantic rainforest

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Intensity, duration and frequency of environmental stresses shape communities through effects on the performance and survival of plants, filtering species that according to its functional traits are able to establish, growth and reproduce in a habitat. An intricate network of interactions, however, obscures our ability to disentangle the relative contribution of the different factors that affect plant fitness. A comprehensive view is currently emerging and indicates that to increase our ability to understand the mechanisms responsible for community assembly in species rich communities, we need to integrate natural and manipulative experiments into complementary lines of ecological investigation. We are studying a variety of plants of the Atlantic forest in southeastern Brazil and its marginal habitats such as granitic outcrops, restingas and high-altitude grasslands. We ask which are the key factors affecting distribution and abundance of plants in the high diversity Atlantic forest and its marginal habitats. Different approaches and ecophysiological techniques were used such as CO_2 and H_2O gas exchange, chlorophyll fluorescence, leaf water potential, pressure volume curves, chlorophyll content, carbon and nitrogen isotopic analysis in leaves. Additionally, responses of seed germination and relative growth rates of seedlings to different availability of water and nutrients, and in some cases, reciprocal transplants of seedlings, have been used to test hypotheses about the factors constraining the distribution and abundance of plants at different vegetation types and along an altitudinal gradient. We observed a diversity of plant responses to environmental stresses, but we are getting multiple lines of evidence that water and nutrient limitation seems to constrain community assembly through effects of varied degrees in plant performance. Thus, integration of multilayered observational approaches with manipulative experiments is helping to elucidate results that in other way would offer controversial evidence for the mechanisms structuring plant communities. (FAPERJ, CNPq).

S19.OC.06

Integrating wood structure and function with the life of tropical rainforest trees

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Wood comprises the bulk of forest biomass, yet knowledge about its functional importance pales compared to our understanding of trees. The main functions of wood are mechanical support, water transport and storage of carbohydrates. When producing wood, the tree has to balance diameter and height increment with mechanical strength, resistance against xylem dysfunction and pathogens. We analysed wood functional anatomy including wood density WD) , vessel are, vessel density and potential hydraulic conductance (kh) of 200+ species from a tropical wet forest in Panama and related these to tree demogaphic parameters. WD was not related to the area occupied by vessels, suggesting little direct trade-off between water transport and mechanical strength. However, it was negatively correlated with kh (which is mostly a function of vessel size), probably because WD positively and kh negatively scales with the gradient from pioneer to shade tolerant trees. We relate tree size and demography to wood function and show that wood structure and function are strongly controlled by ontogeny. A more complete understanding of wood functional ecology will also need to include genetic and ontogenetic variation in chemical composition and ultrastructure, which affect mechanical properties as well as pathogen resistance.

S19.P.01

ECOPHYSIOLOGICAL CANOPY ADAPTATIONS OF NATIVE SHRUBS AND TREES OF THE EASTERN RANGE -A CRITICAL ENVIRONMENT FOR GROWTH (COLOMBIA-SOUTH AMERICA)

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This research was carried out in La Poma Ecologic Park which is part of the Sabana de Bogota landscapes, Colombia, South America. It corresponds to a Low-Montain dry forest with recurrent presence of frosting which generates a critical environment for vegetation growth. Patterns of canopy architecture and functional growth parameters were evaluated and characterized for the shrub species *Abatia parviflora (Ab), Dodonaea viscosa (Dv), Escallonia paniculata (Ep), Myrcianthes leucoxyla (Ml)* and *Xylosma spiculiferum (Xs)* as well as for the tree species *Alnus Acuminata (Aa), Cedrela Montana (Cm), Junglans neotropica (Jn), Lafoensia acuminate (La)* and *Quercus humboldtii (Qh)*, with ages between one and ten years. The hypothesis presented was the existence of particular growth trends associated to a specific architectural pattern. Morphometric leaf, canopy architecture and functional growth variables were evaluated in these species. The ($P < 0.05$) Anova test was used for each variable and as a multiple range test the Tukey test was performed to separate the means. Results showed that the species with higher photosynthetic efficiency and higher capacity of accumulation of dry matter expressed in biomass were *Qh* and *Dv*, these presented an erectophil canopy that generated the highest light absorption. The other species (*Ap* and *Ep*) have planophil and plagiophil canopies which can be linked to a lesser productive capacity. This work foresees the potential of woody shrub species to be used in environments where trees have restricted growth.

S19.P.02

The role of litter quantitative traits on decomposition and nutrient cycling of the forest ecosystems

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Litter production and litter decomposition are key processes of nutrient cycling in forest ecosystems. Different tree species have different nutrient release patterns which are related to litter quantitative traits and seasonal environmental factors. The quantitative traits of leaf litter are important predictors of decomposition and decomposition rates increase with greater nutrient availability in forest ecosystems. At the ecosystem scale, litter quantitative traits are most often related to the physical and chemical characteristics of the litter, for example, leaf toughness and Leaf mass per unit area, and lignin content, tannin content and total phenolics. Decomposition of plant material is an important component in the study of forest ecosystems because of its critical role in nutrient cycling. Thus the analysis of litter quantitative traits and decomposition is highly important for the understanding of nutrient cycling in forest ecosystems. By studying the role of litter quantitative traits on decomposition and nutrient cycling in forest ecosystems we will gain valuable insight to how quantitative traits may influence ecosystem nutrient dynamics. Such knowledge will hopefully contribute to future forest management and conservation practices.

S19.P.03

Effects of xylem water transport on CO_2 efflux of woody tissue in a tropical tree

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Woody tissue respiration plays an important role in budgeting gross ecosystem productivity, but there is increasing concern about the existing values of stem CO_2 efflux estimated by using conventional closed stem respiration chambers. It is assumend that these efflux measurements may be affected by CO_2 diffusion in xylem sap rather than by temperature depending respiratory processes. We assessed the effect of xylem sap flux on radial CO_2 efflux of woody tissue of a tropical tree growing in the Center of Manaus, Brazil. An open chamber system was used to constantly measure diurnal changes in CO_2 efflux with an infrared gas analyzer over several days. Additionally, xylem sap flux was monitored with Granier type thermal dissipation probes. We found a strong relationship between temperature and woody tissue CO_2 efflux during night time. The maximum and minimum CO_2 efflux we found was around 6.5 (day time) and 4.0 (night time) µmol m^{-2} s^{-1}. Normalized CO_2 efflux was reduced by 35% during daytime, probably due to vertical water uptake within the tree trunk. The results suggest a distinct daytime depression of the CO_2 efflux compared with a night time temperature relationship. Xylem sap flux appears to be a major influence on CO_2 efflux rates. The reductions in CO_2 efflux will become most distinct during periods with a high evaporative demand and predictions of CO_2 efflux by the temperature/flux relation are critical during these periods.

S19.P.04

Test of the optimal light use efficiency hypothesis in Andean seedlings: implications for the scaling of photosynthesis

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Introduction. In theory, a plant maximizes its net photosynthesis if all its leaves are exposed to a light intensity that maximizes photosynthetic light use efficiency ($I\varepsilon_{max}$). Leaf $I\varepsilon_{max}$ is typically attained at relatively low light, on the ascending part of photosynthetic light response curves. When light is above $I\varepsilon_{max}$ a leaf could increase its angle of inclination to decrease light incident on its surface, but that also reduces light absorption at the leaf and plant scale. Studies on adult tropical canopy trees show that leaves attain $I\varepsilon_{max}$ and maintain constant daily light use efficiency (ε_{daily}) irrespective of their position in the canopy. However, seedlings may not optimize their use of light because they have poorly developed canopies and the reduction in plant light absorption due to steeper leaf angles may outweigh the benefits of maximizing leaf light use efficiency.

Methods. We planted 50-70 individuals of six Andean tree species along an experimental gradient with 10 light levels that closely mimicked natural changes in light quantity and quality in forests. Plants were allowed to acclimate for 26-106 days depending on their relative growth rate. Then, light incident on leaves was measured every minute for several continuous days and photosynthetic light response curves were obtained *in situ* for each leaf using a LI-6400XT gas exchange system.

Conclusions. Our results show that E_{daily} decreased with increasing PPFD regime and that the peaks of photosynthetic activity were poorly aligned with $I\varepsilon_{max}$; this was attributed to seedlings maintaining relatively horizontal leaves even under high light regimes. The benefits of maximizing light absorption appeared to have been higher than the benefits of maximizing light use efficiency in seedlings. Yet, the scaling of photosynthesis from leaf to ecosystem assuming a constant E_{daily} remains valid because seedling represent a very small fraction of leaves in a forest.

S19.P.05

Cluster-root formation and tissue P concentration in a Brazilian Proteaceae species as dependent on P supply.

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Cluster-roots are considered adaptations that enhance phosphorus acquisition from soils with low P availability. Proteaceae species from ancient and nutrient-impoverished soils in Australia and South-Africa produce cluster-roots when they have low leaf P concentration. The aim of this study was to investigate the effects of P supply on cluster-root formation in a common South American Proteaceae species, *Euplassa legalis.* This species inhabits sandy and relatively nutrient-poor soils in coastal Atlantic rainforests, a global biodiversity hotspot.

We conducted a glasshouse experiment where the production of cluster-roots per plant and tissue P concentration were analyzed for *E. legalis* seedlings grown in sandy soil during four months. Plants were watered three times a week with nutrient solution with the following P concentrations: 0, 10, 50 and 100 mM.

Surprisingly, cluster-roots were not produced in response to P deficiency, as no correlation was found between cluster-root formation and leaf P concentration. However we found a negative correlation between growth and leaf P concentration, suggesting P toxicity at high P supply. Also, visible signs of Fe deficiency, as chlorosis, were observed.

Cluster-root formation in *E. legalis* does not respond to P status, unlike what is known in the literature for other Proteaceae as well as for other plant families. We hypothesize that cluster roots of this brazilian Proteaceae might be formed in response to Fe deficiency, as found for some species. The study of nutrient acquisition mechanisms might be key to explain species coexistence in species-rich and nutrient-poor habitats such as the ones found in the Atlantic rainforest domain.

S20.OC.01

Tropical Dendroclimatology for the Past Millennium

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The vast majority of tree-ring chronologies available worldwide have been developed from temperate and boreal forests. It is remarkable that the most biodiverse terrestrial ecosystems in the world, the forests of the global tropics, have produced so few freely available multi-century tree-ring chronologies useful for exact dating or climate reconstruction (as determined by their availability from the International Tree-Ring Data Bank, hosted by the NOAA Paleoclimatology Program). In the absence of a cold winter dormant season, most tropical tree species do not produce anatomically distinctive annual growth rings and therefore cannot be used for routine dendrochronology. However, annual growth rings are induced in a small subset of indigenous tropical species by strongly seasonal drought, prolonged seasonal inundation on tropical floodplains, temperature seasonality at high elevation, and possibly by the retention of deciduous and annual growth rhythms in a few species that migrated into the tropics from temperate latitudes. For example, tree-ring chronologies have been successfully developed and used for climate reconstruction in the miombo woodlands of south tropical Africa and in the seasonally dry forests of western Guatemala. Dendrochronology provides a rapid method for proving the annual nature of tropical growth bands. With the rigorous application of species selection, wood anatomical principles, crossdating, and climate response analysis, a globally distributed array of exactly dated tropical tree-ring chronologies is feasible.

S20.OC.02

Understanding causes of changed tree growth after gap formation: δ13C-values in tree rings reveal a predominant effect of light

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The formation of tree-fall gaps in closed canopy forests usually entails considerably increases in light and nutrient availability for remaining trees, as well as changes in plant water availability. The effect of gaps on tree growth are highly variable and while usually stimulatory it may also include growth reductions. In most studies, the direct causes of observed changes in tree growth rates after gap formation remain unknown.

We studied changes of carbon isotopes ratios (^{13}C discrimination) in annual growth rings to determine responses after gap formation of *Peltogyne* cf. *heterophylla*, a common shade-tolerant tree in the moist forest of Northern Bolivia. We compared growth and ^{13}C discrimination ($\Delta^{13}C$) of the 7 years before gap formation to the 7 years after gap formation. Forty two trees of different sizes were studied, half of which grew close (<10m) to one-tree fall gaps, the other half more than 40 m away from gaps.

We expected that if higher growth rates were found in association with a reduced $\Delta^{13}C$ then increased light (and/or nutrient) availability by gaps would be the stimulatory factor, while if growth enhancement was associated with increased $\Delta^{13}C$, reduced water stress by gaps would be the cause. Conversely, if lower growth rates were found and if they were associated with reduced $\Delta^{13}C$, than gap formation would have increased water stress.

We found increased growth after gap formation in most medium sized trees and some large trees, but intriguingly not is small trees. Increased growth was mainly associated with decreased $\Delta^{13}C$ indicating increased light availability, possibly in combination with improved nutrient availability. Most trees showing zero to negative growth change after gap formation also exhibited increased $\Delta^{13}C$, suggesting that water stress did not play a role. We speculate that gaps only resulted in small increases of light availability for these trees.

S20.OC.03

Dendroclimatological aspects of Calophyllum brasiliense Cambess. (Calophyllaceae) in different wetland forests of Brazilian ecosystems in the savanna and tropical rainforest

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Calophyllum brasiliense (Cambess.), Calophyllaceae, is a neotropical species with a huge ecological plasticity occurring in different wetlands in Brazil. In this study we compare diameter growth rates, wood densities, age-diameter and climate-growth relationships of 16 populations applying tree-ring analysis. The populations occur in different ecosystems in the Amazon, Central-West Brazilian savanna region (Pantanal, Cerrado) and South Brazilian coastal Atlantic forests (Mata Atlântica) along a gradient of more than 3,000 km. At 16 sites we sampled, analyzed and measured cores and stem disks of a total of 412 trees (15-25 trees per site). Maximum tree age of more than 400 years was found in the nutrient-poor Central Amazonia blackwater floodplain forests (igapó). Mean diameter increment of the populations varied considerably between the studied population with maximum values of 7.0±1.6 mm in the nutrient-rich whitewater floodplains (várzea) and minimum values of 1.6±0.6 cm in the igapó of the Negro River, both located in the Central Amazon region. Mean wood density differ between 0.55 g cm^{-3} and 0.72 g cm^{-3}. We developed mean indexed tree-ring chronologies for different regions (Amazon, transition between Amazon and Cerrado, Cerrado and Mata Atlântica) and compared them to local precipitation and hydrological regimes as well as large-scale climate anomalies such as sea surface temperatures (SSTs) of the Equatorial Pacific and the Tropical Atlantic. We find similarities between mean indexed tree-ring chronologies over large distances indicating the impact of large-scale climate anomalies on tree growth such as SST anomalies of the Tropical Atlantic and Equatorial Pacific as suggested by other dendroclimatic studies in the tropics.

S20.OC.04

Age cohorts of trees in a tropical forest reveal the disturbance history

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We present a disturbance reconstruction based on tree ring dating for two tropical forest sites and we speculate on the effect of past disturbances on observed trends in tree growth. Research was conducted in the seasonal tropical forests of the Huai Kha Khaeng Wildlife Sanctuary, Thailand and La Chonta logging concession, Bolivia. Both forests are characterized by a relatively long (six month) dry season and receive on average less than 1600 mm of rainfall per year. We sampled in two 200 ha plots and in each plot we collected samples from around 400 individual trees belonging to five different species. We collected samples from individuals in all size classes and following an identical sampling protocol. Data on tree age was obtained from tree ring counts on stem discs and tree cores. To reconstruct the disturbance history we first tested for spatial autocorrelation in tree age by calculating Moran's I indices over several distance classes. Second, we identify where different age cohorts of trees occur and what is their spatial scale. These estimations were based on cluster analysis and interpolated maps of tree age created by kriging. The results indicate that both forests contain multiple cohorts of even-aged trees. These cohorts are strong indications for past disturbances, due to for example wind or drought and subsequent fires. The presence of such age cohorts has implications for the interpretation of observed trends in tree growth. We emphasize that long term trends in tree-growth should always be studied taking into account the (known) disturbance history of the forest. Our findings are in agreement with literature pointing at the possibility that some of the observed trends in tree growth can be attributed to recovery from past disturbance.

S20.OC.05

Dendroecology and X-Ray Densitometry in *Pachira stenopetala*, Caatinga of Sergipe/BR

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The Caatinga biome occupies an area of 734.478 Km^2 with different tropical Savanna formations. In mountain caatinga areas occur the diversity of vegetation with Atlantic forest species, as it happens in the Serra dos Macacos, Sergipe. The *Pachira stenopetala* Casar lives at this place due to the constant presence of humidity of the stream monkeys. The soil is shallow, poor with rocky and the water are salinity. The climate presents rainy period between May and July (91,20 mm/month) followed by dry period between October and December (24,02 mm/month), being the annual average of 765 mm. Was studied 43 trees of *P. stenopetala* by X-ray densitometry after established chronology of the growth rings (51 trees, intercorrelation 0,449) by cross-dating method and Cofecha, Arstan and Respo programs. The analyses of X-ray densitometry were accomplished at the ESALQ/USP Laboratory using the QTRS-01X, Quintek Measurement Systems. The results showed abrupt changes of density between the latewood of a ring and earlywood of the following ring. It is made possible to precisely demarcate of growth rings limits and to determine the low, maxim and average densities of each one. The chronologies defined starting from these densities had your variations associated to the temperature and precipitation annual regional, indicated that the precipitation influenced the beginning of the cambium activity, and the temperature contributed to the decrease of the cambium activity during the dry period when is formed the latewood. This results indicated of the *P. stenopetala* is influenced by variations annual of climate causing the wood density variations in the growth rings. The present environmental conditions in the Caatinga corroborate for the formation of growth rings in species of this biome could be applied for ecological studies and of conservation in the northeast of Brazil.

S20.OC.06

Ancient trees in Amazonian floodplains: implications for tropical forest ecology and climate change

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Tree age trees is an important ecological parameter, however, the maximum age of tropical trees (angiosperms) is controversially discussed in literature. In boreal and temperate climate zones trees with ages over 1,000 years are only recorded for gymnosperms growing at the edge of forest establishment characterized by limiting environmental factors (temperature, water availability, flooding, low nutrient status). The inter- and intraspecific competition at these marginal sites is very low and often only one tree species have sophisticated adaptations to grow at these marginal sites. We analyzed a population of *Eschweilera tenuifolia* (Lecythidaceae), a tree species forming monospecific stands at the lowest topographical elevations in the black-water floodplains (igapó) in Central Amazonia. The igapó is regularly flooded by a water regime of low pH and no sediment load resulting in the formation of oligotrophic soils. The study site is characterized by a mean flood height of almost 8 m corresponding to an aquatic phase of about 10 months per year. As a consequence of the annual long-term flooding this and many others species, form annual tree rings. We sampled cores of more than 100 trees of *E. tenuifolia* distributed over different diameter size classes. The wood samples were prepared, tree rings were identified by wood anatomical features (alternating fiber and parenchyma bands) and ring width was measured to construct diameter growth trajectories which indicate ages of more than 1,000 years for tree diameters over 140 cm. This result supports the hypothesis from other climate zones that such high tree ages can only be achieved at marginal sites, but not at the optimum of forest establishment such as terra firme forests. This finding also indicates that climate in the Amazon basin did not change towards wetter conditions during the last 1,000 years, since consecutive years of flooding would have killed these trees.

S20.OC.07

Dendrochronological analysis of Fokienia hodginsii and drought dynamics in Vietnam

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Fokienia hodginsii (Po Mu) is a long-lived tree species in the Cupressaceae family naturally distributed in Southern China, Vietnam, and Lao and that has been previously shown to be sensitive to pre-monsoon drought and therefore ideal for the reconstruction of hydroclimate conditions in Southeast Asia.

Objective: in this study we analyze the influence of drought at different time scales on radial growth of Po Mu as well as past drought dynamics and its possible teleconnections during the last centuries in Southeast Asia.

Methods: we use three multicentury tree-ring width chronologies from (*Fokienia hodginsii*) along a latitudinal transect in the Vietnam highlands. In order to analyze climate forcing on the tree growth, we used different datasets of gridded monthly temperature, precipitation and three drought indices (PDSI, SPI, and SPEI)

Results: the response of tree radial growth to the different drought indices showed that moisture availability before and at the beginning of the monsoon season greatly influences tree radial growth. Spatial correlations between the tree-ring width chronologies and drought indices confirmed that tree-ring width is a representative indicator of drought variability across the region. These correlations proofed to be non-stable during the analyzed period. Spatial correlations with sea surface temperatures (SST) showed a great influence of the tropical Pacific Ocean as warm phases of El Niño Southern Oscillation (ENSO) caused reduced tree growth and therefore reflected low soil moisture. Ring width was also influenced by from the Indian Ocean and the South China Sea that could indicate delayed effects of the Indian Ocean basin wide warming (IOBW) compared to that of ENSO and that would also reduce precipitation.

S20.OC.08

Nitrogen isotopes in tree rings indicate changes in tropical nitrogen cycle

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Pervasive changes in tropical tree growth and carbon budgets are intensively discussed. Tropical tree rings have shown the effect of increasing CO2 concentrations and climate on tree growth, but can be ambiguous tools when searching for growth trends. Apart from CO2 it is unclear which other drivers might have had a persistent and large-scale effect on tropical forests. We analysed nitrogen in tree rings and found changes in N concentrations and N isotope ratios in tree rings of forests in Brazil and Thailand as well as in leaves from Panama. Increasing $\delta^{15}N$ generally indicates a more open N cycle, an interpretation supported by similar changes in leaf N after a decade of N fertilization in Panama. These changes in the N cycle were brought about by substantial increases in tropical nitrogen emissions over the past decades, and consequently an increased N deposition, which, in contrast to CO2, varies by region. Possible consequences of increased N availability are changes in the availability of other nutrients, increased N losses through leaching and denitrification and effects on tree growth.

S20.OC.09

Pan-tropical tree ring research: detecting long-term effects of climate change on tropical forest growth

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The gradual rise in atmospheric CO_2 level and the resulting climatic changes most probably affected tropical forest growth and dynamics. Tropical forests can act either as a sink or a source of CO_2 and can thus speed up or slow down climate change. Understanding how these changes have impacted forests so far is crucial to predict future responses. Several studies show that tropical forests have acted as carbon sinks. These studies are however based on short term datasets (<40 years) and it is still unclear whether this accumulation of biomass occurred over longer periods of time or if were caused by decadal scale climatic variations. Tree ring studies are a powerful tool to obtain long-term growth data of trees.

Here we present a pan-tropical tree ring study on >600 sampled trees of 6 different species covering three continents: South America (Bolivia), Africa (Cameroon) and Asia (Thailand). We analysed long-term changes in tree growth (covering ~150 years) by comparing growth rates of standing juvenile/small trees with that of increasingly older/bigger trees. We hypothesize growth rates to have changed more in the drier sites (Bolivia and Thailand) than in the wet site (Cameroon) as in the former trees can profit more from the increased water use efficiency related to higher CO_2 levels. We also expect a stronger positive change in growth rates on trees growing under more limited conditions (e.g. young trees, shade tolerant species) than on non-stressed trees (i.e. canopy trees or pioneer species). We found that long-term growth changes vary among species and among sites.

S20.OC.10

Dendroecology of two tropical vicariant species from a vegetation mosaic

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The aim of this study was to investigate tree-rings of two tropical vicariant species to comprehend the influence of annual climatic variation and CO_2 increase over tree-ring length, vessel area and intrinsic water-use efficiency of *Hymenaea courbaril* (typical from semi-deciduous forest) and *Hymenaea stigonocarpa* (from cerrado). Eleven specimens of *H. courbaril* and twelve specimens of *H. stigonocarpa* were sampled in a vegetation mosaic. From them, tree-ring length, vessel area and $\delta^{13}C$ chronologies were constructed using standard dendrochronological methods. In order to understand climate data influence on tree-ring width and vessel area, these variables were correlated with monthly climate. The $\delta^{13}C$ values were used to calculate the intrinsic water-use efficiency (iWUE). Results showed that *H. courbaril* had the highest mean values of tree-ring width, vessel area and iWUE. Climate analysis revealed that in both species tree-rings and vessel areas are similarly correlated to temperature and precipitation variation. But correlations have different intensities and happen in different moments of the year. Temperature has a negative influence on tree-ring width and vessel area, while precipitation has a positive influence on them. Intrinsic water-use efficiency analyses showed that both species may have an increasing iWUE trend over last five decades. Only the individuals that are subjected to some kind of stress, and that have reduced growth ratios, may have the described trend. Besides that, there are no strong evidence of correlation between iWUE and tree-ring width and vessel area. Considering possible future scenarios of higher temperature and increasing CO_2 atmospheric concentrations, both species may have a reduced growth ratio and vessel areas due to a higher temperature. Although they may have an increased iWUE, this will probably not compensate the temperature effect as seem in our results. These conclusions must be taken into account when planning policies for tropical trees conservation.

S20.OC.11

Are oxygen isotopes in Amazon tree rings a good proxy for Amazon rainfall?

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We present a new proxy for the reconstruction of variation in precipitation over the Amazon: oxygen isotope ratios in annual rings in tropical Cedar (*Cedrela odorata)*. A century-long record from northern Bolivia, the western end of the basin, shows that tree ring cellulose preserves the signal of oxygen stable isotopes in meteoric precipitation during the wet season, with only minor influence of temperature and vapour pressure. Tree ring $\delta^{18}O$ correlates strongly with meteoric $\delta^{18}O$ from distant stations in the centre and west of the basin and with Andean ice core $\delta^{18}O$ showing that the signal is coherent over large areas. The signal correlates (negatively) most strongly to basin-wide precipitation and Amazon river discharge to the ocean. We attribute the strength of the (negative) correlation mainly to the cumulative Rayleigh distillation in air parcels during westward transport across the basin. We further find a clear signature of the El Niño Southern Oscillation (ENSO) in the record, with strong ENSO influences over the last decades, but weaker influence from 1925 to 1975 indicating decadal scale variation in the controls on the hydrological cycle. The record exhibits a significant increase in $\delta^{18}O$ over the 20th century consistent with increases in Andean ice core $\delta^{18}O$ records. Possible drivers behind this long-term increase include a decrease in precipitation amount in the 'region of influence' or the wind upstream of the study site consistent with a northward displacement of the ITCZ and associated changes in precipitation patterns. Our record may reveal a new path to diagnose and improve our understanding of variation and trends of the hydrological cycle of the world's largest catchment basin.

S20.OC.12

The urge to use dendrochronology as tool for conservation polices of tropical trees

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Recently we observed an increase of interest in tree rings of tropical trees. However, in Brazil, only in few remarkable exceptions (e.g. GOL - Schöngart et al. 2008) these results were used to create public policies for forestry management and conservation. In most cases these important results are not taken into account by decision takers to establish management rules or to confer deforestation permits. In cerrado areas of Minas Gerais State, it is ease and fast to obtain licenses for substitution of natural woods to *Eucalyptus* plantation, with the only restriction of preserving the 'piqui' trees (*Caryocar brasiliense*) because they are used by traditional communities for fruit gathering. What about the other trees? If the rules consider only the species name other trees will not be protected. In Minas Gerais, our results showed that some 'jatobá' trees (*Hymenaea stigonocarpa*) could have impressive ages (up to 140 yr) if compared to their sizes (DBH=33cm) and very small annual increments (0,4 to 2 mm/yr). These increments found in a Leguminosae suggest that increments could be even smaller in non-legume species, considering the nitrogen restriction they suffer in cerrado. In the case of *Podocarpus* spp, a typical subtropical conifer, we can observe a wide range of increments and individual ages, depending on their provenances. In some tropical isolated populations (Northeastern), we found 'old' individuals (90 yr) with very thin trunks (DBH= 12cm) and small increments, while these same species, settled in places closer to their core distribution (South) grow much more (12 to 40 mm/yr), but do not reach long lifetimes. Considering these results we propose that not only species lists and arbitrary trunk diameter values fixed by law to be considered ,when establishing management rules and logging permits. Annual increments and absolute age values must be taken into account and they can only be obtained by dendrochronological studies. Finally we must consider that centenary trees have an intrinsic value as living beings and environmental registries.

S20.P.01

POTENTIALITY OF THE MELIACEAE FAMILY TO DENDROCHRONOLOGY AND DENDROECOLOGY- WITH EMPHASIS TO THE GENUS CEDRELA

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The Meliaceae family is represented in America by 8 natural genera including exotic introduced from other tropical regions of the world. The genus Cedrela is an important component of this family. It is composed of 7 species widely distributed in the tropical and subtropical forests of South and Central America: Cedrela angustifolia, C. fissilis, C. lilloi, C. montana, C. oaxacensis, C. odorata and C. weberbauerii. The American genus Swietenis is composed of 4 species: Swietenia mahagoni, S. macrophylla, S. humilis and S. krukovii. The genus Toona, namely Asiatic cedars, includes at least 11 species, and T. ciliata var. australis, T. calantas and T. sureni are the most important species as regards ecological conditions of Latin America. The genera Cedrela, Swietenia and Toona present many characteristics which are important to dendrochronological studies, such as (i) a large number of species in forest ecosystems of wide ecological diversity, (ii) species with a distinct phonological behavior characterized by leaf fall in the drought season, under both natural and plantations conditions, (iii) anatomical wood characteristics showing well-defined annual tree-rings, (iv) trees with large diameter and, usually, with high growth values, (v) medium wood density, facilitating wood core extraction by non-destructive methods, (vi) available information about age and increment rate, cambial activity and marking, dendrometer bands and seasonality growth trunk diameter, tree-ring width measurements, and (vii) exhaustive literature on taxonomy, dendrology, flora and phytosociology, silviculture and wood technological properties, etc.

This papers presents the principal aspects of the dendrochronological and dendroecological importance of the family Meliaceae, with emphasis to the genus Cedrela, in Latin America. It also includes information on tree-ring analysis applied to different fields of research. Moreover, this contribution aims at promoting further studies on tree-ring analysis of Meliaceae species to expand the development of dendrochronology in the tropical areas of Latin America.

S20.P.02

Application of species modeling to improve dendroclimatological studies in the tropics

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Dendroclimatological studies with tropical trees are becoming a demand, as many studies concerning climate changes depend on historical climate series, with big gaps in those regions. However, it is frequent to find reports of dendrochronological studies where there is no strong correlation between growth rings and climate variables. Specieslink-CRIA databases and experimental data from *Handroanthus impetiginosus* (n=78), *Anadenanthera colubrina* var. *cebil* (n=72) and *Handroanthus heptaphyllus* (n=56) native trees were processed in OpenModeller, testing the environment distance algorithm. Brazilian elevation and climatic data used were taken from Worldclim (resolution of 30').The models were evaluated and the probabilities of species occurrence at the studying area were obtained. The rings sensitivities recorded for the three species at the same site in Pantanal region, Brazil were compared to the occurrence probabilities results. Binomial test was significant for all models. The model for *A. colubrina* var. *cebil* and *H. heptaphyllus* presented excellent performance, with area under the receiver operating characteristic above 0.9, and for *H. impetiginosus* (=0.85) was acceptable, indicating that the models prediction were not random. Although the studying region presents climate seasonality, with a defined rainy season, differences in growth ring correlation were previously observed among species: *H. impetiginosus* presented low correlation and presented the higher occurrence probability among the three species (80-90%) and *A. colubrina* var. *cebil* presented medium correlation, and 70-80% of occurrence. *H. heptaphyllus* has very sensitive rings to annual precipitation, and presented the lowest probability of occurrence prediction by environmental distance algorithm (60-70%) in the studied site, reflecting the importance to select more restrictive sites to establish samples collection to obtain better climate signals in growth rings. Species modeling was shown as a potential tool to highlight potential areas and species to dendroclimatological studies, although site evaluation and previews knowledge of the species must never be disregarded.

S20.P.03

What tree ring studies can and cannot tell us about tropical tree responses to climate change

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Over the last decade, tropical tree-ring studies have become important tools to study the effect of atmospheric changes on tree growth and forest dynamics. Tree rings allow looking backwards over longer timespans compared to plot studies, reconstructing growth histories at annual resolution and analysing stable isotopes and wood anatomy. They are therefore helpful at evaluating long-term responses to changes in growing conditions, physiological and functional responses to atmospheric changes and growth sensitivity to annual changes in growing conditions. Yet, there are limitations to inferences made from tree-ring studies and a cautious interpretation is required. We discuss four limitations and illustrate these with findings from studies in Bolivia, Cameroon and Thailand.

(1) Climate-growth relations estimate growth sensitivity to annual climatic variation. As these relations are based on a small and non-random subset of trees, they provide limited insights into population-level responses to climate fluctuations. Also, their application to climate change scenarios is difficult as they consider annual variation instead of gradual changes. (2) The evaluation of long-term trends is seriously hampered by sampling biases. Also, it is hard to decipher the potential causes of gradual growth increases: CO_2-, N-fertilization or recovery from disturbances. (3) Stable-carbon isotopes values provide estimates of internal CO_2-concentration and physiological responses to changing growing conditions. But interpretation of ^{13}C-variation is complex. (4) Tree-ring studies provide limited information on climate-sensitivity of recruitment and survival, which are important components of the population-level responses to climate change.

The above issues call for cautious interpretation of tree-ring results and for applying new approaches. We propose multi-proxy analyses to determine causes of growth changes, mechanistic tree growth models validated by tree-ring data to predict responses to climatic changes, and demographic studies to integrate climate-induced changes in growth, survival and recruitment on tropical tree populations.

S20.P.04

ENSO-sensitive proxy based on high-frequency densitometry of *Manilkara huberi* (Sapotaceae) a characteristic tree species form the Central Amazon rainforest

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Instrumental climate data in the Amazon are of insufficient length to describe the natural variability of precipitation regimes and their association with the large-scale ocean-atmospheric factors such as the El Niño-Southern Oscillation (ENSO). In this study we present a dendroclimatic proxy from *Manilkara huberi* (Sapotaceae), a commercial tree species from the Central Amazonian terra firme forests which forms annual tree rings as a consequence of rainfall seasonality. Tree rings are indicated by an alternation of fiber and parenchyma tissues with a distinct fiber band marking the boundary of the tree ring which in some cases is macroscopically difficult to detect. To produce a reliable marker of the tree rings we applied high-frequency (HF) densitometry, an innovative method measuring the relative wood density variations along wood surfaces at high resolution utilizing the dielectric properties of wood. From 16 trees cross sections were carefully prepared and on each transversal surface ten parallel radii with distances of 0.5 mm between them were measured with HF-densitometry. The series were averaged to eliminate wood density variations caused by vessels and to identify the maximum wood densities at the ring boundaries. Ring width corresponds with the measured distance between the wood density peaks. Individual ring-width series from eight trees were successfully cross-dated. The mean indexed chronology correlates significantly with rainfall data for the study region as well as sea surface temperature anomalies from the Tropical North Atlantic and the traditional El Niño regions. We found also a close congruence with Berlage's tree-ring chronology from Java, Indonesia, for the period between 1725 and 1929 despite a distance of more than 18,000 km between the two study regions. This can be explained by teleconnections between both regional precipitation regimes and ENSO and indicates the potential of dendrochronology and specifically HF-densitometry as a powerful tool to get insights to past climate conditions of the tropics using tree rings.

S20.P.05

Effects of the rainy season on growth of Mimosa tenuiflora in dry tropical forest, Brazil

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Mimosa tenuiflora is a native pioneer tree from the Caatinga. It is deciduous, losing its leaves at the end of the rainy season, its trunk does not reach large diameters and it has good regrowth capacity. *M. tenuiflora* is used commercially as firewood due to its high calorific value, and is also used for animal feed. This study intended to confirm the formation of annual growth rings in *M. tenuiflora* and to determine the annual increment in diameter and its correlation with rainfall. Disks (destructive samples) from the stem base of *M. tenuiflora* trees were collected in 2008 in Sertânia and Serra Talhada, Pernambuco State, from regrowth from trees coppiced in 2003 and in Limoeiro do Norte, Ceara State, from a plantation established in 2002. The rings from each disc were marked, counted and measured in four rays. The values of the ring widths were compared by Pearson correlation with the rainfall values of the years prior to their formation, considering each year as beginning in August and finishing in July, in order to include the rainy period (when most of the plant growth occurs) in one year. *Mimosa tenuiflora* trees from the Caatinga have well-defined annual growth rings highly correlated with annual precipitation and are well-suited to dendrochronological investigation. Forest managers must consider the influence of previews drier years in the wood production when predicting cutting cycle. The high growth correlation with the previous year's rainfall in regions where the rains start after photoperiodic stimulation indicate the necessity of understanding the growth dynamics of the species under dry forest conditions through additional ecophysiology studies.

S20.P.06

Divergent growth responses to water availability may explain the coexistence of tree species in Bolivian tropical dry forests

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Climate, and particularly water availability (WA), is one of the most important drivers of tree growth in tropical dry forests (TDF). Different growth responses to WA of sympatric tree species could be another important element to understand the coexistence mechanisms. We explored this idea by using dendrochronology to quantify how basal area increment (BAI) of six sympatric tree species (*Acosmium cardenasii*, *Anadenanthera macrocarpa*, *Aspidosperma tomentosum*, *Centrolobium microchaete*, *Tabebuia impetiginosa*, *Zeyheria tuberculosa*) responds to WA in a Bolivian TDF. We fitted linear mixed-effects models to BAI values (period 1954-2010) as a function of seasonal WA data estimated from local climatic data. All relationships between BAI and water balance were positive, particularly during the rainy seasons (early rainy season, late rainy season and transitional rainy-to-dry season) both in the previous and current (the year when the tree-ring is formed) years. Contrastingly, during the driest seasons (dry season, transitional dry-to-rainy season) BAI was unrelated to WA in all species. The tree species differed in the strength of the relationships between BAI and WA during the rainy seasons. In general, a positive WA during the rainy seasons enhanced growth in *Z. tuberculosa*, *C. microchaete* and *A. cardenasii*. In the case of *A. macrocarpa*, BAI increased in response to a positive WA during the early rainy season of the previous and current years whereas *T. impetiginosa* growth responded only to the WA of the previous-year early rainy season. Lastly, BAI in *A. tomentosum* reacted positively to the WA of the transitional rainy-to-dry season during the current year. We conclude that sympatric tree species show divergent responses to WA and that these differences may be an additional factor to explain their coexistence in TDFs.

S20.P.07

Oxygen Isotope Analysis in Tree-Rings of *Pterocarpus angolensis* in Zimbabwe

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The scientific understanding of variations in southern Africa's climate, in relation to other parts of the world, is deficient and the lack of paleoclimate data is considered a major hindrance to understanding historical, present, and future climatic variability. Much can be learned by analyzing the $\delta^{18}O$ of a-cellulose in tree rings which, as illustrated from prior research, can allow for effective paleoclimate reconstructions. For our research, two potential proxies have been combined, ring-width and $\delta^{18}O$ values of tree-rings from two Kiaat trees (*Pterocarpus angolensis*) from the Matabeleland province of Zimbabwe, in order to investigate annual precipitation variability in Zimbabwe. In 2006, a 201-year rainfall chronology for Zimbabwe was created using this same species of tree. The chronology was significantly correlated with summer rainfall (November-February) and explained 46% of the instrumental rainfall variance during the period from 1901 to 1948. Research thus indicates that *P. angolensis* are valuable trees for the reconstruction of paleoclimates in southern Africa. Applying the Modified Brendel technique, α-cellulose was isolated from raw wood samples extracted from *P. angolensis* and analyzed using continuous flow isotope ratio mass spectrometry. The isotope ratios are reported on the Vienna Standard Mean Ocean Water Scale (VSMOW). A 60-year $\delta^{18}O$ chronology was created and correlated with annual precipitation totals, meteoric water $\delta^{18}O$ values, and the Palmer Drought Severity Index. A strong negative correlation was identified between the $\delta^{18}O$ values of meteoric water and annual precipitation totals for the years 1960 to 1978, which is a result of the 'Amount Effect' experienced in tropical regions. Preliminary results suggest that the $\delta^{18}O$ values represent at least 16% of the variance in seasonal rainfall (November-February) over Zimbabwe.

S20.P.08

Growth rings in deciduous tree species from northern Minas Gerais, Brazil

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To date, many Brazilian forest ecosystems remain with no information regarding tree age and growth yields of the arboreal species. The discovery of tree species with annual growth rings and the environmental factors involved on ring formation is the basis for the development of dendrochronology and its various applications in tropical and subtropical ecosystems. Forest formations from the north of Minas Gerais, southeastern Brazil, are located in the transition zone of three biomes (Atlantic Rain Forest, Cerrado and Caatinga), following the moisture gradient towards the northeast. Plants are submitted to high rainfall seasonality, and present strong deciduous behavior, indicating an important trigger for annual ring formation. Nevertheless, we found no reports of tree ring analysis for this region. Therefore, we conducted an exploratory field survey in the municipalities of Pandeiros, Januária and Itacarambi, in order to identify some species with distinct growth rings in the following seasonally dry forest types: Arboreal Caatinga, Dry Forest, Crystalline Caatinga, and Cerrado. A total of 24 tree species were sampled using increment borers. The major challenge encountered was the difficulty to sample hardwood tree species with high wood density using the available increment borers. Sampled cores were mounted, sanded and examined under the stereomicroscope. Seven tree species presented clear growth ring boundaries with great visibility for future dendrochronological research: *Cedrela fissilis* Vell., *Ceiba pubiflora* (A. St.-Hil.) K. Schum., *Ceiba rubriflora* Carv.-Sobr. & L.P. Queiroz, *Cyrtocarpa caatingae* J.D. Mitch. & D.C. Daly, *Hymenaea martiana* Hayne, *Hymenaea stigonocarpa* Mart. ex Hayne, *Pseudobombax marginatum* (A. St.-Hil., Juss. & Cambess.) A. Robyns. Future work will intensify the sampling of the selected species and apply dendrochronology methods to test the annual nature of growth banding and relationships with climatic variables. We expect to contribute to forest conservation and sustainable management of these seriously threatened forest remnants.

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Keywords: dendrochronology, seasonally dry forests, conservation

S20.P.09

Tree ring studies of *Cedrela odorata* L. from Caatinga, Sergipe

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The growth rings show the influences of weather events on tree growth. They can elucidate environmental conditions which trees were exposed in the past, indicating forest dynamics patterns, as plant growth models, with accurate estimates of age, growth rates and phenology in relation to environmental changes, such as climatic variations. The *Cedrela odorata* L., a deciduous tree, has growth rings visible to the naked eye, with great potential for application in dendroecological studies. This species occurs along all Brazilian territory, including the Caatinga biome. Porto da Folha region in the state of Sergipe, presents semi-arid climate, with annual precipitation average between 300-800 mm and annual temperatures between 26 and 28°C. The soil is poor, ranging between rocky and sandy. Fifteen trees where sampled for this study application the cross-dating method, with the assistance of COFECHA and ARSTAN programs to the construction of one chronology. We used the RESPO program for the evaluation of the relationship between the ring formation and climatic conditions. The production of a preliminary chronology proved to be possible with a satisfactory intercorrelation between the growth rings series, the main difficulty being the presence of false rings, characterized by thin marginal parenchyma bands with smaller number of vessels associated, possibly formed by sporadic rainfall during dry periods. The study showed the relationship between the rates of annual increase and environmental factors, especially precipitation. This study confirms the advances of tropical dendrochronology, ecology and environmental conservation.

S20.P.10

Contrasting the association of tree ring series from two tropical dry season-deciduous species: *Intsia bijuga* from Madagascar and *Enterolobium cyclocarpum* from Costa Rica, with yearly precipitation data.

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Dendrochronology is difficult with tropical trees because the lack of strong seasonal temperature amplitude yields wood with poorly defined or even absent growth rings from which to extract age and growth data. I asked whether yearly drought deciduousness in two tropical tree species, *Enterolobium cyclocarpum* (Guanacaste) from northwestern Costa Rica and *Intsia bijuga* (Hintsy) from eastern Madagascar (both in the Fabaceae family), would induce clearer, more identifiable yearly ring patterns since growth is halted or significantly reduced during the leafless period that coincides with the drier part of the year in both areas. In 1997, two cores were extracted from each of 20 Guanacaste trees in Santa Rosa National Park, Costa Rica, and from each of 9 Hintsy trees in the Tampolo Forest Reserve, Madagascar. Hintsy cores yielded well-defined growth rings that were dated and measured using a Velmex® linear dovetail slide, and entered into a MeasureJ2X® database, each core yielding a ring-width *series*. Lining up bar graphs of all series in Excel® to match ring years was used to cross-date the ring series using pattern mismatch among series as a guide to add or remove missing or false rings, respectively (max. of 1 year added or removed per 10-year period). 1978-1997 Hintsy yearly growth ring width data were positively associated with 1978-1997 total yearly precipitation data obtained from the Center for Meteorology and Hydrology, Madagascar ($df = 179$, $P < .05$, $R^2 = .03$). By contrast, Guanacaste cores yielded nearly ring-less wood from which no ring series could be measured and analyzed for their association with total yearly precipitation data from Liberia, Costa Rica, even though the drier season in northwestern Costa Rica lasts longer and is more pronounced than that of eastern Madagascar. Some drought-deciduous tropical trees are thus good candidates for dendrochronology-based investigations.

S21.OC.01

An Extreme Case of Plant-Insect Co-Diversification: Figs and Fig-Pollinating Wasps

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It is thought that speciation in phytophagous insects is often due to colonization of novel host plants, because radiations of plant and insect lineages are typically asynchronous. Recent phylogenetic comparisons have supported this model of diversification for both insect herbivores and specialized pollinators. An exceptional case where contemporaneous plant- insect diversification might be expected is the obligate mutualism between fig trees (Ficus species, Moraceae) and their pollinating wasps (Agaonidae, Hymenoptera). The ubiquity and ecological significance of this mutualism in tropical and subtropical ecosystems has long intrigued biologists, but the systematic challenge posed by >750 interacting species pairs has hindered progress toward understanding its evolutionary history. In particular, taxon sampling and analytical tools have been insufficient for large-scale co-phylogenetic analyses. Here, we sampled nearly 200 interacting pairs of fig and wasp species from across the globe and then sequenced up to 5.5 kb for each of these plant and insect species. Separate Bayesian phylogenetic analyses for figs and fig wasps under relaxed molecular clock assumptions indicate Cretaceous diversification of crown groups and contemporaneous divergence for nearly half of all fig and pollinator lineages. Event-based co-phylogenetic analyses further support the co-diversification hypothesis. Biogeographic analyses indicate that the present-day distribution of fig and pollinator lineages is consistent with an Eurasian origin and subsequent dispersal, rather than with Gondwanan vicariance. Overall, our findings indicate that the fig-pollinator mutualism represents an extreme case among plant-insect interactions of coordinated dispersal and long-term co-diversification.

S21.OC.02

Genetic structuring, variation in receptive fig odours and the phylogeny of the locally-associated pollinator species in *Ficus septica*, from Mindanao, Philippines to Taiwan

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Interspecific mutualisms are intricate interactions that arise between different species as a result of coevolution. The fig-fig wasp pollination mutualism is a classic example of this type of interaction. To assure the assembly of the mutualism in every generation of both the fig and the wasp, fig trees have to emit specific scent profiles to attract their pollinator wasps. Within species variation in fig scent is likely to result from strong selective pressures as it might lead to instability of the mutualism. In this study, we investigated the effect of geography, sex of the plant and season on the fig scent variation of *Ficus septica.* Scent collection was done through the headspace dynamic technique and scent samples were analyzed in a gas chromatography-mass spectrometry system. Overall fig scent collected from four study sites (Luzon, Visayas, Mindanao and Taiwan) significantly differed and the main compounds of the scent profile of each location also differed from each other. Furthermore, season (dry versus rainy) and sex of the plant (male versus female), along with atmospheric and edaphic factors, did not have significant effects on the observed scent variation. Microsatellite data, however, did not directly corroborate with the scent data. Luzon and Visayas belonged to one genetic unit, Taiwan another unit and Mindanao another genetic unit. Scent variation in one genetic unit (Luzon and Visayas) tells us that scent is subjected to selective forces that microsatellites are not subjected to. Also, it seems that the significant effect of location cannot be attributed to extrinsic environmental factors. Scent variation may correlate with different species of wasps pollinating *Ficus septica* in different locations. If fig wasps are effectively speciating on islands concurrently with receptive fig odour differentiation, then we have documented a situation of ongoing codiversification between figs and fig wasps.

S21.OC.03

Genetic structuring in six Asiatic *Ficus* species in Taiwan and at a broader geographic scale: biogeographic and biological insights

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We investigated genetic structuring in six Asiatic species of *Ficus* using nuclear microsatellite markers with a focus on species occurring in Taiwan. The aim was to try to determine 1) which geographic barriers have been of importance in determining current distribution of genetic diversity, 2) whether what we know of the biology of individual species allows better understanding this structuring, and 3) whether the reduced *Ficus* diversity of Taiwan could lead to patterns suggesting niche modification.
In several species we observed remarkable genetic homogeneity throughout continental China (and Thailand) as opposed to stronger genetic structuring between Taiwan and the Philippines in other species. Gene flow within subcontinent can be strong. Wide ranging species may be divided into major geographic genetic entities such as India versus Asia and Australasia, or continental China versus continuity between South Thailand, the Philippines and Taiwan. Such patterns suggest generalist adaptation and limited selection for adaptation to local conditions. They also show that division into major genetic entities follows patterns that can be observed in the distribution of vicariant sister species.
At a reduced geographic scale, within Taiwan, we observed patterns of incipient genetic differentiation within some species. This suggests that within a context of reduced *Ficus* species diversity, despite potentially strong gene flow, processes of diversification that could lead to speciation are at work.
The pattern emerging from genetic structuring in continents and islands is in agreement with patterns of speciation as can be inferred from extant species distributions within genus *Ficus*.

S21.OC.04

Fig trees and the fig-fig wasp mutualism in fragmented landscapes

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Fig trees are important keystone species on tropical forests. Given the intense process of forest fragmentation that occurs in Brazil, we studied the effect of habitat fragmentation on fig species populations in Semideciduous Seasonal Forests. We selected 3 regions in Sao Paulo State with different levels of forest fragmentation: Pontal do Paranapanema (PP: ~40%), Gália (Ga: ~15%) and Ribeirão Preto (RP: ~5% of forest cover). Since 2007 we assessed the population structures of fig tree species, the community of fig wasp species, and the mutualism stability. We found 8, 6 and 6 fig tree species in RP, Ga and PP, respectively. We observed a species-area effect, which the fragment area explained about 30-60% of the variance of the number of fig tree species. In addition, fig species assemblages in single fragments were complementary, suggesting that even small forest fragments are important for conservation of the regional pool of fig species. Fig tree species with contrasting ecological features (e.g. *Ficus citrifolia* = pioneer; *F. eximia* = secondary ecology) showed different responses. For *F. citrifolia* we found a more diverse wasp community and stronger impact of parasite fig wasps in more fragmented landscapes. In addition, we detected *F. citrifolia* does better in less fragmented landscapes, showing higher production of pollinating wasps and seeds. Conversely the secondary species, *F. eximia*, did not show a clear pattern. Our results suggest fig tree species and their associated wasps are relatively robust to habitat fragmentation, due probably to the long distance pollen dispersion mediated by agaonid wasps and to the capacity of some fig species to grow on the landscape matrix. These results pose a challenge of how to suitably study and preserve species involved in very complex ecological interactions (Financiamento: Fapesp).

S21.OC.05

Host range and diversification of resource use in Neotropical fig wasps

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Host preference and oviposition behavior have played important roles on the ecology and evolution of plant-insect interactions. Here, we analyzed host specialization and feeding regime of several wasp species associated with 8 host species representing the Neotropical *Ficus* sections *Americana* and *Pharmacosycea*. *Americana* group pollinator's larvae are strongly dependent on flower pollination. Their larvae are adapted to plant development, with two contrasting larval feeding strategies proceeding alongside gall development. The first two larval stages behave as ovary parasites. Later larval stages feed on hypertrophied endosperm. Fifty seven percent of studied non-pollinating fig wasp (NPFW) species use more than one host. Nevertheless, we observed high index of specialization in the NPFW-*Ficus* food web, which may reflect their preference and/or strict association to hosts. Approx. 75% of studied NPFW species is cleptoparasites or parasitoids and lays their eggs after pollination. Fifteen percent of species are fig-wall/young-flower gallers and oviposit before pollination. The remaining 10% of species oviposit at the same time as pollination and gall ovary of female flowers. The higher diversity and abundance of wasps that oviposit after pollination seem to be related to the wider temporal window to oviposition. This could open more opportunities feed-regime specialization and species radiation. Conversely galler species seem to be more constrained in terms of oviposition opportunities. Especially oviposition in ovaries of receptive flowers requires precise egg deposition, which reflects on a more refined ovipositor structure of these galling wasps. Oviposition after pollination seems to be less precision-constrained and ovipositor structure is more variable among species and less refined. Financiamento: Fapesp

S21.OC.06

Extended longevity in fig wasp in response to selection generated by its mutualistic partner

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Adult life spans of only one or two days characterise the life cycles of the fig wasps (Agaonidae) that pollinate fig trees (*Ficus* spp., Moraceae). Natural selection is expected to favour traits that maximise the value of the timing of encounters between such mutualistic partners, and fig wasps are usually only attracted to their hosts by species- and developmental-stage specific volatiles released from figs at the time when they are ready to be pollinated. Here we describe an anomalous relationship between *Ficus altissima* and its pollinator *Eupristina altissima*, where large aggregations of *Eupristina* females waiting to enter the figs can appear on trees with well-synchronized crops of young figs. The wasps staying on the leaves will inevitably die while waiting for figs to develop receptive phase. Using field experiment and observation, we found that the maximum longevity of adult *E. altissima* females was longer than that of congeneric species. *F. altissima* was also exceptional in that it had a second associated agaonid that failed to pollinate its figs. Adults of this 'cheater' species survived almost as long as the pollinator. The wasps staying on the leaves faced two risks that prevented water loss and ant's predation. The spiracles of *Eupristina* wasps were scanned and showed that *E. altissima* and the 'cheater' species had special sack-like structure around the spiracle. It could be advantage to reduce water loss. Using Y-tube to test the behavior response of *Oecophylla smaragdina* to agaonid wasps and their *Ficus* hosts, the results showed that the *Oecophylla smaragdina* predated any wasp once they encountered, but new leaf and young figs of *F. altissima* had repellent effect on the ant. This is possibly an adaptive response to wasps staying on the leaves to wait fig development. Our results suggest that the new adaptive evolution prompt to maintain fig-fig wasp mutualism.

S21.OC.07

Comparison of pollination biology in different forms of Ficus auriculata

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In the obligate mutualism between figs (*Ficus*) and their specific pollinators (Chalcidoidea, Agaonidae), each species of fig wasp typically reproduces in figs of a single host species. Host specificity is maintained largely because pollinators are attracted to tree-specific volatiles released from their host figs, but whether the wasps can reproduce if they enter figs of non-host species is unclear. We investigated the reproductive success of *Ceratosolen emarginatus* (associated with Cauliflorous form of *Ficus auriculata*) and *Ceratosolen* sp. (associated with Stoloniflorous form of *F. auriculata*) in atypical hosts by experimentally introducing foundresses into host and non-host figs. Cauliflorous form figs entered by *Ceratosolen* sp. were more likely to abort than if entered by *C. emarginatus*, but abortion of stoloniflorous form figs was not affected by pollinator species. Single *C. emarginatus* foundresses produced more but smaller offspring in stoloniflorous form fig than in their normal host. Conversely *Ceratosolen* sp. produced fewer but larger offspring in cauliflorous form fig than in their normal host, probably as a result of having longer to develop. Mean style length differences, relative to the lengths of the wasps' ovipositors, may have dictated the number of offspring produced, with oviposition made easier by the shorter styles in stoloniflorous form figs. Our results imply that, in addition to morphological constraints and tree-specific volatiles, reduced reproductive success in atypical hosts can be another factor maintaining host specificity, but for other species only behavioural changes are required for host switching to occur.

S21.OC.08

Non-wasp fauna of Neotropical fig tree species: new insights on the fig-insect associations.

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Fig trees play an important role on the functioning of tropical forests. Fig species are keystone resource for several groups of animals and represent one of the most specialized systems of pollination mutualism. Studies have mainly focused on the association of fig trees and chalcid wasps. However, a number of non-wasp insects use figs as resource, showing a diversified range of ecological interactions. In order to assess the species that are associated with fig trees, as well as their role on the fig-fig wasp mutualism, we sampled the non-wasp insect community associated with *Ficus* in a Semideciduous Atlantic Forest in Southeast Brazil. From December 2010 to November 2011 we randomly collected syconia (fig inflorescence) at different stages of development. The figs were incubated at laboratory conditions in glass vials for *ca.* 45 days and all emerging insects were collected and stored for later identification. We found a total of 37 species of five orders of insects associated to syconia of five fig species. Coleoptera was the most diverse order with 13 species. While two species of Staphylinidae were ubiquitous to all fig species, Curculionidae groups were section-specific, i.e. *Pharmacosycea* and *Americana* sections. Diptera and Hymenoptera (both with nine species) were represented mostly by phytophagous larvae and parasitoid wasps respectively. The community of non-wasp insects presented diversified feed regimes, such as gall-makers, seed predators, fig wasp predators and generalist insects. Our survey suggests this fauna may exert an important selective pressure on the fig reproduction. Thus, this non wasp fauna represent new opportunities of ecological studies, contributing to the better understanding of the ecology of figs and their associated animals.
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S21.OC.09

The genome of a fig pollinating wasp *Ceratosolen solmsi*

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Figs and fig-pollinating wasps are obligate mutualists that have co-evolved for over 60 million years. During the long evolutionary history, the pollinators have evolved many characters adaptive to their lives within the unique compact syconia provided by the figs. We here try to trace these adaptive characters in the genome. We present a draft genome of *Ceratosolen solmsi* (Hymenoptera: Chacidoidea: Agaonidae) associated with *Ficus hispida* (*Ficus*: Moraceae), assembled from Illumina Sequencing reads obtained from all the male offspring of the same grandmother wasp. We used comparative genomic methods to obtain insight into the unique features of the *C. solmsi* genome. For example, we found that this genome has much fewer genes annotated than its close relative *Nasonia vitripennis*. Additionally, we identified that *C. solmsi* harbors the least putative olfactory receptors genes except another insect species obligatory parasitic to human, the body louse. We also studied the genes composition of the immune systems, including the insecticide resistance and dietary detoxification. Putative horizontal transfer elements were also been screened. Some of these and other unique aspects of the fig pollinator genome are likely linked to the peculiar living environment within the compact syconia of this species.

S21.OC.10

Host sanctions and pollinator cheating in the fig tree - fig wasp mutualism.

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Mutually beneficial interactions between two different species – mutualisms - are of fundamental ecological importance. Theory predicts that mutualisms are vulnerable to invasion by cheaters, yet mutualistic interactions are both ancient and diverse. What prevents one partner from reaping the benefits of the interaction without paying the costs?

We examined mutualism maintenance in six fig species and their respective pollinator wasp species by experimentally comparing the fitness of individual wasps that did or did not perform their most basic mutualistic service, pollination. We show that figs are able to impose sanctions that reduce the fitness of uncooperative wasps, and that the intensity of these sanctions varies dramatically across host species. We further searched natural populations of pollinators for wasp individuals that did not carry pollen ("cheaters"). Pollen-free wasp individuals occurred only in the wasp species that engage in the energy-costing active pollination, and their prevalence was negatively correlated with sanction strength of the host species. These empirical findings support the theoretical prediction that in mutualisms, host sanctions can enforce cooperation in the associated symbionts.

S21.OC.11

Fig chemistry explains a "lust for salt" in Western Amazonian stenodermatine bats

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Geophagy is a widespread behavior among plant-eating animals. In the Neotropics, mineral licks are activity hotspots for frugivorous bats. They drink mineral-rich water accumulated in soil depressions made by geophagous mammals. Two non-mutually exclusive, mechanistic hypotheses have been proposed to explain this behavior: licks are reliable sources of limiting nutrients, especially sodium; and licks provide substances that render dietary toxins less harmful. We assessed the former by examining the composition and nutritional content of fruits consumed by bats in conjunction with lick water chemistry. We determined the diet of 22 bat species and assessed their correlation with lick visitation in southeastern Peruvian Amazonia. We also determined the nutritional composition of *Ficus* fruits from the study area and other regions and analyzed the concentrations of five key nutrients. We found that most bats visiting licks belong to the subfamily Stenodermatinae and are specialists on *Ficus* fruits. Although *Ficus* fruits are good sources of calcium, magnesium, potassium, and nitrogen, their sodium content is limited in relation to the physiological requirement of a small mammal. In contrast, bats in the subfamily Carolliinae supplement their frugivorous diets with insects, which may provide sufficient amounts of sodium. We found that lick water has higher concentrations of sodium compared to other available water sources. These results strongly support the sodium-limitation hypothesis for lick use by frugivorous bats. Furthermore, they suggest a mechanistic link between bats and terrestrial ecosystem engineers that make soil-borne resources available. Because sodium is an essential nutrient for vertebrates and *Ficus* is a keystone resource for many animal species, our results may have broader implications for the community of frugivorous vertebrates in areas where sodium is limited. Soil licks may play a critical role as sodium sources and thus they should be considered as important conservation targets.

S21.OC.12

Using a phylogenetic framework to investigate the drivers of extant fig diversity: a comparison of figs and their closest relatives Castilleae (Moraceae)

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The figs, a clade of ca. 850 species, are well-known for their obligate pollination mutualism with fig wasps and as keystone plants in many tropical ecosystems. From an evolutionary perspective, figs represent a speciose and diverse lineage of angiosperms. Phylogenetic work on the fig and mulberry family, Moraceae, has identified the sister group of figs, the Castilleae, which comprise 11 genera and 60 species. A central goal in evolutionary biology is understanding the drivers of diversity, which can be of particular interest when rates of evolution are accelerated. Figs and Castilleae provide an excellent opportunity to study such a question; as sister groups, each lineage has experienced the same amount of evolutionary time yet differs greatly in species numbers and extant diversity and distribution. It has been hypothesized that the enormous success of the figs (relative to Castilleae) can be explained by the mutualism with pollinating wasps and by related adaptations such as the specialized inflorescence, the syconium or 'fig.' However, such key innovation hypotheses that seek to explain fig diversity have not been directly tested. Also, fig diversity can now be discussed in the context of evolutionary history. Of particular interest is Castilleae, the lesser-known sister lineage of figs that does not possess syconia and includes a mixture of insect and wind-pollination syndromes. We study the diversity of figs and Castilleae in an evolutionary context making use of the most comprehensive phylogeny of the two lineages. Using this phylogenetic framework, we aim to test for shifts in rates of diversification and identify morphological or biogeographical factors that may have played a role in the success and accelerated rates of diversification of the figs. Ultimately, we hope to begin to disentangle the key events that led to the evolution of figs, a diverse and successful lineage of flowering plants.

S21.P.01

Effect of habitat loss on the mutualistic interaction between *Ficus eximia* and its associated pollinators

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Brazilian forests, especially in the central and southeast regions, have been subject to intense habitat fragmentation. This study evaluated the fragmentation effects of semideciduous seasonal forests in São Paulo on the mutualistic interaction between *Ficus eximia* - an often freestanding tree that grows mainly in the interior of forest fragments - and its associated pollinators (Hymenoptera: Agaonidae). Our approach comprised two scales: (1) landscape scale, for which we compared data from the studied regions, namely Teodoro Sampaio (less fragmented), Gália (intermediate) and Ribeirão Preto (more fragmented) and (2) local scale, for which we considered the characteristics of the surrounding landscape of the sampled plant. We investigated whether pollen availability is correlated with landscape structure. We collected figs after the pollinator had entered the fig and before offspring and seeds had completed their development and measured number of figs without pollinators and number of pollinators per fig. The results showed the number of unpollinated figs was not correlated with the proportion of forests 1 and 5 km around the sampled tree. However, the availability of pollinating wasps was significantly higher on more fragmented landscapes. We showed that Ficus-fig wasp mutualism appears to be robust to landscape changes. The pollination system mediated by agaonid wasps and enhanced by the wind, seems to allow pollen transfer between trees spaced several kilometers apart. Therefore, this biological system seems to be insensitive to small-scale environmental changes (Support: Fapesp 04/10299-4).

S21.P.02

Size of forest patches, richness and abundance of fig trees (Ficus sp)

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The palms acurí (*Attalea phalerata*) are important hosts for the onset of several species of fig trees in the Pantanal. Therefore, the density of acuris and the size of the forest patches areas can be determinants for the amount of species and individuals from fig trees in these patches. The aim of this work was to assess whether the abundance and richness of fig trees can be determined by size of capões (stational forest patches, Pantanal) as well as the amount of acuris, and the abundance and richness of the fig trees. For doing so, we have sampled the density of acuris, the abundance and richness of fig tress related to them and the total area of 18 capões on São Bento farm (transect=6Km, Miranda's Pantanal, Brazil). There was a strong correlation between the size of capões to the number of acuris($r = 0.83$; $p < 0.0001$). In this sense, we have correlated only the size of the abundance of fig trees, which has shown to be highly significant ($r = 0.909$; $p<0.001$). The richness of species of fig trees had a low correlation to the size of the capões($r=0.144$; $p<0.119$). In fact, there was a strong propensity for the capões to be colonized by a few species which have shown high abundance (Correspondence Analysis; Axis 1 = 56.4%, Axis 2 = 36.3%). In this sense, although there is a tendency for the wider areas to be likely to include more species, we have found a highly heterogeneous pattern of association between species of fig trees and capões, which future studies might clarify.

S21.P.03

Ecology of a Population of Halysidota sp. (LEPIDOPTERA: ARCTIIDAE) in an Ficus sp. (ROSALES: MORACEAE) in Campus Uvaranas of the State University of Ponta Grossa - Paraná

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The Arctiidae family is among the main families of nocturnal lepidopteran that are used to monitor natural ecosystems. In Addition to being aposematics most of these moths are also toxic and unpalatable. The Brazilian studies about the gender species of *Halysidota* are scarce, which they are concentrated in agricultural economic purpose. The point of this study was to observe the population density, spatial distribution, mortality, and the population dynamics of caterpillars of the gender *Halysidota* sp. in a tree of *Ficus* sp., located in Campus Uvaranas of the State University of Ponta Grossa. During April to June in the year 2011, it was realized weekly survey and four collections in order to lift the data. The spatial distribution of the population is aggregate, and even during the night, when the insects went out to eat the tree's leafs, they remained all together. Each individual of the population of *Halysidota* sp. showed black color and a red cephalic capsule differing from each other in the amount of hair. Smaller individuals with low weight showed less hair, and so these are more susceptible to predation and environment adversities. The mortality rate was equal to 60,14%. It was not observed immigrations and migrations to others populations of *Halysidota* sp. The permanence of the population at the tree of *Ficus* sp. occurs due to the shelter proportionate for the tree's roots, as well as it is known that the family Arctiidae members use chemical compounds of the leafs on the hair as a defense against predators. Further studies should be done with populations of Arctiidae in their natural habitats due to agricultural economic and medical importance, so as to further information on its biology.

S21.P.04

Community structure of wasps on sympatric fig tree species in the Pantanal of Brazil.

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Fig trees are associated with diversified chalcid wasp communities, constituting a formidable opportunity to perform comparative studies. Fig wasps represent different guilds with diverging feed strategies. Galler wasps are phytophagous and may exploit fig wall or fig ovaries; cleptoparasites are phytophagous but use galls induced by other galling species; parasitoids feed on galler larva. We studied the community structure of wasps on four *Ficus* species (*Ficus carautana, F. crocata, F. pertusa* and *F. obtusifolia*) in the Pantanal region during July 2008 to July 2010. Specifically, we compared the diversity of species and the abundance of each guild among these communities. We also investigated the correlation of wasp diversity and the fig size. We haphazardly sampled 25 figs from 2-6 trees of each study *Ficus* species. Figs were individualized in plastic flasks to obtain all wasps emerging from each fig. The diversity of wasps on each fig host was expressed by species richness and the community structure was quantified by the proportion of wasps of each guild. The number of species per wasp community varied from 5 (*F. crocata*) to 15 (*F. obtusifolia*). Wasp diversity was not correlated with fig size. The highest proportion of pollinating wasp (92%) was recorded for *F. crocata,* whereas the lowest (62%) was recorded for *F. obtusifolia.* Community structures were similar among fig hosts; pollinator was the most represented guild, followed by cleptoparasite species. Pollinators, as internal colonizers, have rapid access to greater proportion of resources. Consequently, cleptoparasites have access to the abundant pollinator galls as resource. Our results suggest that the structure of fig wasp communities is mainly shaped by the feed strategies of wasps. (Financial support: Capes, FAPESP).

S22.OC.01

Evolution of ecological networks

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Ecological communities can be defined as a set of interacting populations. Ecological networks are a fair representation of such communities which highlight the complexity of the direct between-species interactions that occur in the present time. However, many ecological networks have been shaped in the past by evolutionary and coevolutionary processes that generate adaptations that determine specializations and set limits to the possible interactions. The ecological network literature is growing steadily, with the appearance of new network metrics, null models, softwares, and network-based community stability theory. Recently, the availability of phylogenetic hypotheses for most taxa and the development of new analytical methods are expanding our understanding on how the evolutionary past influences the present-day ecological networks. Here we use several bipartite networks of plant-pollinators and plant-seed dispersers, as well as animal and plant phylogenies, to answer the following questions: (i) does the evolutionary history of plants and animals shape their present-day interactions , (ii) is there an asymmetry in the strength in which the evolutionary history of animals and plants determine their interaction?, (iii) is this asymmetry similar between mutualistic systems? We show that the evolutionary history of both partners can influence the networks, however, asymmetries are apparent both between animal and plants and between mutualistic systems.

S22.OC.02

Geographic patterns in plant-hummingbird networks

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Large-scale geographical patterns of biotic specialization and its underlying drivers are poorly understood, but it is widely believed that climate plays an important role in determining specialization. As climate-driven range dynamics should diminish local adaptations and favor generalization, one hypothesis is that contemporary biotic specialization is determined by the degree of past climatic instability, primarily Quaternary climate-change velocity. Other prominent hypotheses predict that either contemporary climate or species richness affect biotic specialization. To gain insight into geographical patterns of contemporary biotic specialization and its drivers, we use network analysis to determine the degree of specialization in plant-hummingbird mutualistic networks sampled at 31 localities, spanning a wide range of climate regimes across the Americas. We found greater biotic specialization at lower latitudes, with latitude explaining 20-22% of the spatial variation in plant-hummingbird specialization. Potential drivers of specialization - contemporary climate, Quaternary climate-change velocity, and species richness - had superior explanatory power, together explaining 53-64% of the variation in specialization. Notably, our data provides empirical evidence for the hypothesized roles of species richness, contemporary precipitation and Quaternary climate-change velocity as key predictors of biotic specialization, whereas contemporary temperature and seasonality seems unimportant in determining specialization. These results suggest that both ecological and evolutionary processes at Quaternary time scales can be important in driving large-scale geographical patterns of contemporary biotic specialization, at least for co-evolved systems such as plant-hummingbird networks. We discuss how these findings may relate to geographic patterns of network topology, such as modularity, and how hummingbird evolutionary history, morphology and behavior may explain their role in network structure.

S22.OC.03

Spatio-temporal dynamics in plant-pollinator interaction networks

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Ecological interaction networks is a key approach to study interactions at the community level. Many species interact with diverse groups of mutualistic partners across space and time, however, the spatio-temporal variation in plant-pollinator networks, and associated ecological and evolutionary consequences, has received little attention and is still poorly understood. We use field sites of cerrado savanna and rupestrian fields in Brazil to study the spatial and temporal dynamics in plant-pollinator network structure and to assess the plasticity of species and the degree of rewiring of interactions over time. Advancing our knowledge on spatio-temporal dynamics of species interactions is sorely needed to answer unsolved questions in community – and pollination ecology.

S22.OC.04

Plant-pollinator network interactions of four sympatric species of *Psychotria L.* (Rubiaceae).

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The network theory has been used to understand interactions between plants and pollinators. Frequently, studies with this approach do not take into account that only a fraction of flower visitors transfers pollen efficiently among flowers and are effective pollinators. Generally, extensive field observations are required to identify effective plant-pollinator interactions. In this study, the interactions among four sympatric species of *Psychotria* and their pollinators were analyzed from the perspective of the network theory. Here, the main aim was to verify the existence of pollinators sharing among these four plant species. The study was conducted in a fragment of Semi-deciduous Forest located in the Cerrado Biome. Data collections occurred in January, during the flowering peaks of *P. prunifolia* (Kunth) Steyerm, *P. hoffmannseggiana* (Willd. ex Schult.) Müll.Arg., *P. capitata* Ruiz & Pav., and *P. deflexa* DC. A total of 25 species of visitors were identified and 56% of them interacted only with one plant species. The exotic bee *Apis mellifera* had the highest number of interactions. *Psychotria capitata* showed the most generalist network and *P. huffmannnseggiana* had the most specialized pollinator interaction. The network showed a strong asymmetry (-0.71) with nested patterns (NODF = 21.81), demonstrating that the most specialized species of these network form a subgroup that interacts preferentially with the most generalist species. It showed also low connectance (0.38) with low number of links per species (1.31). Our results show that these sympatric species of *Psychotria* share their pollinators in different proportions. There is a gradient of more generalist species pollinators interacting asymmetrically with more specialized plants.

S22.OC.05

Nested bird-flower networks: comparing different approaches

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Bird pollination in the Neotropical region is definitely known as an important interaction to ecosystem function. Hummingbirds are the most important vertebrate pollinators in the Neotropics, while perching birds visiting flowers are still very often observed as merely opportunistic visitors. In a two-year study in the Atlantic rainforest in Southeastern Brazil, bird activities on flowers as pollinators or thieves/robbers were recorded along the year and in the vertical stratification. Sightings were made every month, along line transect samplings and while accessing canopy with climbing equipment and focal observations. We used the NODF metric (Nestedness metric based on Overlapping and Decreasing Fill) to run a nestedness analysis to compare the different levels of this ecological system: pollination *versus* visitation, and specialized hummingbirds *versus* generalist perching birds. A total of 48 species of plant were visited by birds, but only 36 could be pollinated by them, and only 34 were considered ornithophilous species. Thirteen hummingbird species were recorded at the study site, but only three species were residents, besides nine species of perching birds registered also visiting flowers. Bird-flower network was nested-like. However, if we include the set of ornithophilous species in the wider set of pollinated species by birds, and this one is contained in the set of visited species by birds, nestedness decreases as more plant species are included in the network. In the same way, nestedness of all bird-flower network was lower than hummingbird-flower network. Adding species of birds or plants in a network may change not only the nature of the interaction, but also influence the nestedness, changing the strength and the dependence among interacting species.

S22.OC.06

Plant-pollinator networks in two Cerrado physiognomies

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Studies of ecological interaction networks are a key approach for understanding ecological and evolutionary processes. Some properties of plant-pollinator networks do not consistently vary between sites, although species richness and composition are expected to change. Aims of this study are to describe plant-pollinator networks in two Cerrado physiognomies, riparian forest (RF) and rocky savanna (RS), to compare specialization in community and population levels, and to test for the occurrence of modularity in the networks. Species composition greatly differed between the study sites, with no plant species co-occurrence and only 5.8% of pollinator species coincidence. Degree of pollinators was low, with 71% singletons in RS and 86% in RF. The two recorded networks were nested, which could be an advantage, since nestedness provides more stability to perturbations, like species and habitat losses. Specialization index was high for both RF (H_2' = 0.91) and RS (H_2' = 0.75), what is probably affected by the great number of singletons, especially in RF. The networks showed greater modularity (18 modules in RS and 15 in RF) than expected by chance. Despite the low richness of hummingbird species in both sites they were the pollinator group with the highest centrality. In addition, hummingbirds presented high values of standardized Kullback-Leibler distance (d'). High centrality and great values of d' suggest that hummingbirds play a key role in community structure and in its stability, mainly because they connect poorly or non-connected regions of the network. The exotic bee *Apis mellifera* was the main connector in RS and the pollinator with the great strength, likely due to its pronounced generalization regarding to flower use. The importance of this alien species in the studied network could decrease connectivity among pristine mutualists, thus possibly disturbing plant-pollinator mutualisms.

S22.OC.07

Spatial variation in plant-pollinator networks

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Species diversity and interactions vary on a landscape scale and are sensitive to landscape alterations, such as landscape fragmentation and habitat degradation. Despite this, several structural properties of ecological interaction networks have been argued to make these networks robust to perturbations such as species extinctions and habitat loss. In this study we analysed the mutualistic plant-pollinator network in three communities of increasing degree of habitat degradation, within a heavily managed forest landscape. We found the alpha- and gamma-diversity of both species and links to be highest in the young forest community (intermediately degraded), while beta-diversity was highest in the old growth forest community (least degraded). The size of the plant-pollinator network (plants × pollinators) was lower in the old growth forest community. We analysed the nestedness, the degree strength relationship, link strength asymmetry and cumulative degree distribution for all three communities and found no significant difference. We conclude that despite an increase in overall diversity in the more degraded communities, the higher species turnover in the old growth forest community indicates a homogenization of the plant-pollinator networks as a result of habitat degradation. Our data also suggest that the structural properties of mutualistic interaction networks, previously argued to make these networks robust to perturbations, prevail after habitat degradation. We believe this to strengthen the argumentation for the importance of these structures for the persistence and stability of mutualistic networks in real ecosystems.

S22.OC.08

The restoration of pollination networks in Atlantic forest

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Disturbed areas suffer from species loss and of loss functional processes such as mutualistic interactions. Understanding how the pollination interaction networks are shaped during the successional process may support restoration actions in tropical ecosystems. Four plant-pollinator interaction networks at different stages of restoration (four, five, six and seven years stages) and at different forest management (natural regeneration and forest plantation) in the Atlantic Forest were compared. The importance of herbs and shrubs was detected at the beginning of the restoration process, as they increase the availability of resources in areas where pioneer tree species can take from two to ten years to initiate the reproductive phase. Consequently, these generalist plants attracted and interacted with specialist and/or rare insects, which most likely came from the heterogeneous landscape of the area. The number of flies species recorded was slightly higher than bee species, but the bees were much more abundant. Younger areas attracted more insects and more insect species probably due to a higher resource availability (herbs) in these more open areas. Connectance reduces along the stages of restoration, but the topological structure of the network did not vary much between the restored areas in functional terms (*M*, *N*, average degree). Pollinator composition at the same stage was similar independent of management condition. This was probably due to the proximity of the different stages, and to the low plant diversity. There was a tendency for reduced generality in older plots, indicated by the variation in the distribution of the number of interactions and species specialization index. At the Atlantic Forest restored areas, animals took one year longer to present less generalist species, probably due to their higher sensitivity to disturbance. The forest restoration changes the interaction network modifying the species properties and adding more specialist interactions to the network.

S22.OC.09

Restoration of plant-pollinator networks

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Two of the main challenges facing restoration ecologists are defining restoration endpoints and setting up appropriate restoration practices by which to achieve them. Ecological theory may guide restoration ecology in facing these challenges. First, the theoretical principles developed from studying the changes in structure and function of communities during succession can provide a framework for planning and predicting the restoration of a particular community. Second, ecological theory can aid restoration by helping to identify those species which are likely to produce highest benefit to the restored community. In this study we address these challenges in the context of the functional restoration of plant-pollinator networks. We constructed 30 quantitative plant-pollinator networks along a managed successional gradient to identify the main drivers of change in network structure. We then applied two alternative restoration strategies *in silico* (restoring for functional complementarity or redundancy) to data from our early successional plots to ask whether different strategies affected the restoration trajectories. Changes in network structure were explained by a combination of age, tree density and variation in tree diameter, even when variance explained by undergrowth structure was accounted for first. In simulations, the priority assigned to the reinstatement of each plant species depended on the restoration strategy, which resulted in different restoration trajectories. Using a network-approach for conservation ecology provides a powerful tool for directing management decisions, particularly when management seeks to restore or conserve ecosystem function.

S22.OC.10

Plant-pollinator networks and fragmented landscapes: does plants' breeding system matter?

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Breeding system (BS) determines the degree of dependence of plants on pollinators for pollen deposition modulating species vulnerability to pollinator decline. Therefore, the evaluation of the relationship between BS and species attributes in plant-pollinator networks may improve our understanding of community fragility to species loss in fragmented habitats. We examined whether species degree (k), nestedness (Ni), within module degree (Zi) and among-module connectivity (Ci) differ among autonomous self-pollination, dioecious, self-compatible non autonomous and self-incompatible plants, in a regional plant-pollinator network from a fragmented landscape. The regional plant-pollinator network was characterized by 32 days of field surveys and 5120 min of pollinator observations in 16 fragments of Bosque Chaqueño, central Argentina. Plant breeding systems were assigned following results from field studies and from the literature. Autonomous self-pollination and dioecious species showed higher degree than self-compatible non autonomous and self-incompatible plants. Moreover, the formers had higher values of Ni than self-compatible non autonomous species. Contrary, Zi and Ci did not differ among groups. Autonomous self-pollination and dioecious species were network hubs (species with high Zi and Ci), whereas self-compatible non autonomous plants were mainly peripherals (species with low Zi and Ci). In addition of being network hubs and showing higher degree and Ni, autonomous self-pollination species are low pollinator-dependent plants, resulting in potentially higher network robustness to pollinator loss. Likely, dioecious plants (i.e. high pollinator-dependent) might buffer pollinator decline by interacting with many species and thus contribute to network robustness. However, the loose of particular pollinators interacting with self-compatible and self-incompatible plants might have a high negative impact on species and interaction diversity.

S22.OC.11

Does the modularity of mutualistic networks depend on the degree of interaction intimacy between interacting species?

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Mutualisms are usual interactions along the life history of individuals of most species. The patterns of interaction between the species vary depending on the type of mutualism. To be considered as profitable to both partners, different types of mutualism can have degrees of interaction intimacy. Interaction intimacy is the degree of biological association among interacting individuals. So, interaction intimacy between the involving species may shape mutualistic networks. We studied how the pattern of interaction varies between three types mutualistic interactions: frugivory, plant-pollinator and ant-plant protective mutualisms. Defensive ants are highly linked to their myrmecophyte plants because individual plants host ant colonies leading to sustained interactions between individual partners. In contrast, frugivore species only need to perform a single, short-term visit to disperse seeds. Differently, pollinators need to perform two short-term visits to the same plant species to effectively pollinate, while. We hypothesized that these interactions will differ in the formation of cohesive subgroups of interacting species, (modules) depending on the degree of interaction intimacy. We analyzed the existence of a modular pattern in 24 frugivory and plant-pollinator and 10 ant-plant matrices from all over the world. After controlling matrix size, the modularity was higher in ant-plant interactions, intermediate in plant-pollinator interactions and lower in plant-frugivore networks. We conclude the degree of interaction intimacy between partners is an important factor structuring mutualistics networks in simple and predictable ways.

S22.OC.12

Species roles in plant-frugivore networks in the Atlantic Rainforest and their sensitivity to human disturbances

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Species roles in interaction networks have been a recently explored topic in ecological studies. Each individual species plays different roles in determining the overall structure of the network in which they are embedded and identifying the species that contribute most to network topology can be a promising approach in designing conservation strategies aiming to preserve natural communities. Among interaction networks, mutualistic ones have been important in generation and maintenance of biodiversity. More specifically, frugivory networks assume particular importance in tropical rainforests, where most woody species rely on animal vectors to disperse their seeds and many vertebrates use fruits as food resources. In this sense, our main goal was to identify the most important bird species in determining the structure of networks between plants and frugivorous birds in a well-preserved Atlantic Rainforest remnant in Southeastern Brazil. First, we showed that several descriptors of species role in networks such as number of interactions, contribution to nestedness, standardized within-module degree and among-module connectivity can be synthesized in a single variable, which estimated the species contribution to network structure. Then, we were able to identify the birds that contributed most to network topology: *Carpornis cucullata* (Cotingidae), *Thraupis cyanoptera* (Thraupidae), *Lipaugus lanioides* (Cotingidae) and *Pteroglossus bailloni* (Ramphastidae). Given the widespread human actions that threaten biodiversity in Atlantic Rainforest, we also explored possible effects of bird sensitivity to anthropogenic disturbances on their values of contribution to network structure. We found that the species that contribute most to network structure are the highly sensitive to human disturbances. Our results show that vulnerable species are the main responsible for community stability in the studied system and conservation efforts may consider their importance as structuring agents in biodiversity organization.

S22.P.01

Interactions networks plants and hummingbirds in cerrados areas of the Triângulo Mineiro and region

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The ecological and evolutionary dynamics of species can be influenced by interactions between plants and animals coexisting. Data on these interactions are important for understanding the functioning of community and for the conservation and maintenance of the flora and fauna. Modern methods and metrics of interactions networks have been used to understand the organization of species in such communities. The objective of the present study was to describe the interaction networks between plants and hummingbirds in three cerrado *s.s.* areas, the Panga Ecological Station (EEP) and the Clube de Caça e Pesca Itororó de Uberlândia (CCPIU), in Uberlândia city, Minas Gerais state, and the Serra de Caldas Novas State Park (PESCAN), in Caldas Novas city, Goiás state**.** In each area we used two transects of one hectare each, which were followed every other week to identify the plant species used by hummingbirds, which were also identified. Based on field data and literature records, the interaction networks between hummingbirds and plants for each area were built and analyzed. The hummingbirds (13 species) visited 22 plant species in the three areas. In the PESCAN there were nine species of hummingbirds visiting 12 plant species, in the CCPIU 10 hummingbirds species visited 12 plant species, and in the EEP seven hummingbirds species visited 17 plant species. The number of possible interaction ranged around of 115,67 and the number of observed interaction was 43,67. The interaction networks showed assymetry and nestedness, patterns similar to the described for other mutualistic networks, and average of connectance (38%) even greater than observed for other plant/pollinators networks. *Palicourea rigida* was the plant species most visited by the hummingbirds in most areas and *Amazilia fimbriata* was the hummingbird which visited the greatest number of plants.

S22.P.03

Maximizing forest restoration using network analysis of seed dispersal

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The forest restoration intends not only increase the species diversity, but also restore ecological processes, such as seed dispersal. The techniques of forest restoration involve the selection of plant species to be planted in order to maximize seed dispersal by attracting generalists dispersers that could interact with many plant species. One way to achieve this goal is promote nestedness in tree-disperser network. Nestedness is a common pattern in mutualistic networks, where a core of generalists plant and animals species interact with each other and specialists species tend to interact with generalists ones. The aim of this study was to test for nestedness in a seed dispersal network in a restored Atlantic Forest area and investigate the biology of the generalists species. The study was made in a forest restored 25 years ago with a high diversity of tree species in São Paulo state. We used the "Nestedness based on Overlap and Decreasing Fill" (NODF) method to calculate nestedness and tested this value against 1000 random matrices. The seed-disperser network in this restored forest was highly nested (NODF = 43.46; p = 0). The main species forming the core of the nested network were the birds *Tangara sayaca*, *Turdus leucomelas*, *Tangara cayana*, and the trees *Cecropia pachystachya* (Urticaceae), *Clausena excavata* (Rutaceae) and *Myrsine coriacea* (Primulaceae). These bird species were undemanding about habitat, and generalist in relation to diet, exploiting resources other than fruits. Similarly, *C. pachystachya* is a pioneer species that is widely dispersed by birds and mammals, whereas *M. coriaceae* produces abundant small fruits dispersed mainly by birds. Despite providing fruit all over the year that attract several potential dispersers, we suggest the management of the exotic tree *C. excavata*, which has a high competitive potential, decreasing the seedling richness of other species with a long term detrimental effect in the restored forest.

S22.P.04

Exotic bee is one of the most generalist bee species on Brazilian bee-plant interaction networks

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Determining bee and plant interactions has an important role in understanding the general biology of bee species, as well as the potential pollinating relationship between them. Bee surveys have been conducted in Brazil since the end of the 1960s. Most of them applied standardized methods and identified the plant species where the bees were collected. In plant-pollinator interactions, species are commonly seen as generalists when they interact with many species of different taxa, and specialists if they interact with one or a few closely related species. It has already been demonstrated that in pollination systems the most generalized species are usually network keystone species. Since they interact with most plant species, they play an important role to maintain the whole network. To analyze the most generalist bees in 47 Brazilian bee surveys, we built a matrix of bee-plant interactions. The most generalist bees were estimated by determining the three bee species of each surveyed locality that presented the highest number of interactions. Surveys were conducted in urban areas, Tropical Dry Forest (Brazilian Caatinga), Tropical Shrublands (Brazilian Cerrado), and in Tropical Moist Forest (Brazilian Atlantic Forest) biomes. We found 39 species of bees, most of them belonging to Apidae (31 species) and Halictidae (6) families, and to Meliponini (14) and Xylocopini (6) tribes. On most surveys *Apis mellifera* and/or *Trigona spinipes* were the most interacting species. Considering the first and second species with the highest number of interactions, *Apis mellifera* was present on 75% of the Brazilian surveys and *Trigona spinipes*, on 64%. *Apis mellifera* is an exotic bee species and *Trigona spinipes*, a native species. Both are widespread and present broad diet breadth, high number of individuals per colony and an aggressive foraging behavior, which are probably the most important features to explain these results.

S22.P.05

The effect of trait matching in hummingbird-plant interaction networks

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Nestedness, small word proprieties and asymmetrical interactions are some of the topological characteristics of pollination networks. Mechanisms as neutral effects, phylogeny, spatial and temporal overlap and species phenotypes may be behind these patterns. Here we evaluated the effect of trait matching on some metrics of the interaction among hummingbirds and plants using 11 networks from the Atlantic forest, southeastern Brazil. To evaluate trait matching, we calculated the normalized mean difference among corolla size and hummingbird beak. The netwoks analysed had different sizes, most of which were nested. Conectance and nestedness reduced with network size, as expected. In most of the networks, plant average degree were larger than for hummingbirds, indicating more generality in plants. In our networks plants had smaller average degree in the smaller networks, as expected since network size influences the number of interactions. It was not observed on hummingbird average degree. The shorter corollas were visited by hummingbirds with longer beaks than the corollas. The longer corollas were visited by hummingbirds with shorter beaks than the corollas. As the corolla augmented in length, the differences among corolla and beaks reduced indicating that the morphological adjustment improved in longer flowers. Although corolla size did not limited the number of hummingbirds species interacting, more specialized flowers (species with a higher d´) were visited by hummingbirds with more similar beaks in four networks and more specialized hummingbirds visited flowers with more similar corollas in two networks. Some networks were too small to be evaluated. Trait matching influenced some of the species level network proprieties indicating that the interactions had not the same probablity to occur.

Keywords: networks, corolla size, hummingbird beak size, Atlantic Forest.

S23.OC.01

The ornaments of life: evolution of bat-plant interactions

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The reproductive biology of tropical and subtropical plants is dominated by mutualistic interactions with animal pollinators and seed dispersers. Among these pollinators and seed dispersers are over 280 species of bats found in two families, Pteropodidae (Old World fruit bats) and Phyllostomidae (New World leaf-nosed bats). Pteropodidae is the older of the two families, and it currently contains about 12 species of morphologically specialized nectarivores and over 160 species of frugivores. The younger Phyllostomidae currently contains about 36 species of nectarivores and 70 species of frugivores. Collectively, these bats pollinate the flowers of about 500 species of plants and disperse the seeds of many more species. In this paper we discuss the distribution of bat pollination and frugivory across the phylogeny of angiosperms, compare and contrast these two families as pollinators and seed dispersers, and discuss in detail likely evolutionary pathways to nectarivory and frugivory in each family. Despite being a relatively young family, the phyllostomids appear to have evolved more specialized relationships with their flower and fruit species and families than the older pteropodids. We discuss possible reasons for this biogeographic difference.

S23.OC.02

Acoustic Analysis of Fruit Bat Activity in Fragmented Central Amazonian Forest

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Fruit bats are essential in most tropical forests for their roles as seed dispersers and pollinators. While foraging, these bats must balance the risk of predation against the need to obtain resources. Thus their use of habitat may change depending on the perceived risk of predation (the extent of local forest, the openness of the environment) and the reward (fruit cluster size, total tree crop). We examined bat activity in relation to fragment size, habitat type, and crop size at the Biological Dynamics of Forest Fragments Project North of Manaus, Brazil. During 40 detector-nights (March – May), we monitored bat activity using acoustic detectors (Wildlife Acoustics SM2BAT 384KHz with ultrasonic microphone) at forest fragments of various sizes and disturbance and with fruiting *Vismia* trees of differing crop sizes. We used the Sonobat full-spectrum analysis system to parameterize calls and counted all bat passes with starting frequencies over 45 KHz and a dominant slope > 1.0. Our recordings of captured bats allowed us to find an index to roughly categorize bat calls as insectivorous or frugivorous from the full-spectrum analysis. Out of habitat classified as abandoned pasture, secondary forest, 1-ha fragment edge, 10-ha fragment edge, and 100-ha fragment edge, secondary forest had the highest average number of passes; abandoned pasture had the lowest average number of passes. However, there was wide daily variation in number of passes. Trees with large fruit crops received more visitations than those with small crops. We hypothesize that certain frugivorous bats prefer to forage in areas of high *Vismia* productivity, but may stay relatively near some patch of intact forest. We discuss the implications of these behaviors on seed dispersal and bat conservation.

S23.OC.03

Are Neotropical bats good indicators of environmental disturbances?

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Science has searched for tools to indicate, measure or predict the responses of organisms to environmental disturbances. Neotropical bats have been identified as potential indicators and the number of articles using them is increasing. But contradictory results indicate the need to assess the viability to widely use bats for that purpose. A review on bat responses to forest fragmentation, logging, agricultural conversion or plant sucession was performed to detect patterns and problems, and to identify what is the emerging message. Variations of up to 17 times in the number of replicates, 360 times in the size of experimental areas, 166 times in the size of control areas, and 36 times in captures were detected. Almost 90% of the studies used mistnets, resulting in analyses biased towards phyllostomids. No clear pattern was observed regarding bat responses to the disturbances tested, from no effects on species richness between fragments and control areas, to higher abundances in the surrounding matrices. Most of the studies indicated species-specific responses, and conclusions were based, on average, on 20 species, a fraction of the regional richness. Neotropical bats should be used cautiously as indicators and generalizations should be avoided. Despite the problems identified, bats may contribute to the study of the topic in the Neotropics, as long as basic precautions are followed.

S23.OC.04

Bat diversity along a human disturbance gradient on Mount Kilimanjaro

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Bats are vital to many ecosystem functions such as seed dispersal and arthropod predation. Therefore, it is important to understand how bats respond to major threats such as land use intensification. We investigated insectivorous bat assemblages at the Kilimanjaro Mountain using a standardized acoustic monitoring design at 19 study sites along a land use gradient from natural lower montane forest over agroforestry plots and commercial coffee-plantations to grassland. We classified echolocation search calls to sonotypes as a proxy for species identity, and utilized occurrence counts as a measure of relative bat abundance. In the statistical analysis we included abiotic as well as biotic characteristics of the study sites that may influence the occurrence of bats and controlled for altitude.

Preliminary results show distinct but non-significant differences in species richness and evenness between habitat types, with highest species richness recorded in coffee-plantations. Species composition differed significantly among habitat types. Relative abundance as well as feeding activity differed significantly among habitat types with highest values in coffee-plantations and lowest values in forest sites.

The results indicate that abundance and feeding activity of insectivorous bats is remarkable high in coffee-plantations compared to other habitat types, even after controlling for altitudinal effects. Nevertheless, forest bat communities are distinct and include unique species. Hence for protection of forest-specific species, forests cannot be replaced by alternative habitat types.

S23.OC.05

Fragmentation effects on Neotropical bats: lessons learned from Panamanian land-bridge islands

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The landscape matrix is increasingly being recognized as crucial in determining species responses to habitat loss and isolation in human-modified landscapes. Land-bridge islands, which may e.g. arise as a result of dam construction, constitute fragmented systems of high structural contrast between isolates and the matrix, and are often considered model systems for investigating fragmentation impacts. Here I will provide an overview of the main findings of a comprehensive study that examined bat responses to forest fragmentation within a land-bridge island system in Panama, capitalizing on the fact that potentially confounding factors such as time since isolation and surrounding matrix were controlled for. Bats were sampled over a 2-year period on 11 islands in Gatún Lake and at edge and interior sites on the adjacent mainland. Compared to continuous forest, islands harbored less diverse and structurally and functionally simplified assemblages. Although species composition was not significantly altered, species richness was significantly lower at continuous forest edge compared to interior sites and edge-related effects were discernible at the species and ensemble level. Gleaning animalivorous bats were almost exclusively restricted to continuous forest and nearly absent from islands distant from the mainland; high edge-sensitivity and limited mobility may underlie the particular sensitivity of this group. Distance from the mainland and percent forest cover were the best predictors of species richness and composition, whereby responses were dependent on spatial scale. Bat distributions on islands followed a nested subset structure, and nestedness was correlated with island isolation rather than area, pointing towards isolation-dependent, selective colonization as the underlying mechanism. At the larger landscape scale, habitat loss rather than changes in landscape configuration seem to be the main process underlying bat responses, suggesting that conservation efforts should focus on habitat preservation instead of trying to minimize fragmentation per se at the expense of habitat amount.

S23.OC.06

Monitoring Program and Conservation of the Bat fauna associated to the Santo Antonio hydroelectric dam, western Brazil

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Within Brazil, large rivers of the Amazonia have been disrupted by hydroelectric dams under the arguments of energy crises impairing the acceleration of the economy. Impacts of dams in bats are virtually unknown, and programs to predict and minimizing them are lacking. We analyzed the bat communities in the Santo Antônio hydroelectric area, lower Madeira River, western Brazil, before the flood of the reservoir to (1) test if the bat communities vary between areas that will/will not be inundated; (2) identify species that may be more affected; (3) compare the Santo Antonio communities with other communities nearby (BR-319 highway). Data collection included mist-nets captures using standardized *PPBIo* protocols (http://www.ppbio.inpa.gov.br), and surveys in rock outcrops of the river, using hand-nets. A total of 49 sites for mist-nets captures (8 nets/site) were distributed in 7 independent modules, each comprising 7 sampling sites. Each site was sampled 3 times, resulting in 147 sampling nights. We recorded 1550 individuals and 56 species, and roost searching data revealed the intensive use of rock outcrops by *Nyctinomops laticaudatus*. Capture frequencies were similar between areas that will/will not be flooded, but richness was higher in areas that will not be flooded. At least 7 species may be more affected by the lost of future areas underwater. Animalivorous gleaning bats were the most frequently captured in sites that will not be flooded. HMDS ordinations indicated composition difference between sites that will/will not be flooded, and between the Santo Antonio and BR-319 areas. Also, the outcrop roosts of *N. laticaudatus* will disappear in an area of 200 km, an unparallel disturbance for the populations in the region. We concluded that the conservation of small, distant and disconnected areas along the River may not replace the necessary conditions to conserve the bat fauna of the Santo Antonio hydroelectric region.

S23.OC.07

Bat-plant networks: small mutualistic worlds

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There is much accumulated knowledge on mutualistic interactions at the organism and population levels, but relatively little is known about the community level. Network theory has helped much to fill this gap in the past years. In this talk I will summarize what has been discovered about the structure of multi-species interactions of seed dispersal, pollination and other mutualisms, and what role bats play in these networks. Bat-plant networks, as pointed out by recent studies, seem to be “tiny worlds within small worlds”. That is, modules of densely connected species, which have different structure and robustness compared with other modules (e.g., birds and fruits) and with ‘whole’ seed dispersal networks formed by several taxa (bats, birds, primates, carnivores, fish etc.). In these tiny worlds, highly specialized frugivorous bats seem to be the cores, which have higher relative importance for maintaining the whole network structure. Other biological attributes, such as body weight and size of the geographic distribution, may also play a minor but important role in determining the centrality of a bat species in a seed dispersal network. Furthermore, bat species of the same genus seem to have nested diets, as in the case of *Carollia* bats, which focus on *Piper* fruits, but differ in how many other plant taxa they consume. In conclusion, current evidence points out that the generation and maintenance of the seed dispersal service in local communities depends on a balance between ecological redundancy within modules and complementarity among modules, and on the hierarchy of relative importance among frugivore species.

S23.OC.08

Bats as pollen and seed vectors in the Pantanal, Brazil

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The Pantanal floodplain is a recent geological formation located in the dry diagonal crossing South America. Fauna is composed by species widely distributed over neighboring formations, with rare cases of endemism. Here we review the knowledge of bats potentially acting as pollen and/or seed vectors in the Pantanal. Data was accumulated throughout the last decade, based on records of pollen and seeds in fecal samples, and on captures of bats in front of plants. Ten bat species were recorded as pollen and seed vectors, plus two species found as pollen vectors only. These bats consumed floral resources on nine plant species, and consumed fruits on 13 ones. *Glossophaga soricina* and *Phyllostomus discolor* were common flower-visiting bats in the Pantanal. *Artibeus planirostris*, *A. lituratus*, *Sturnira lilium*, *Platyrrhinus lineatus*, *Carollia perspicillata*, *Phyllostomus hastatus*, *Lophostoma silvicolum*, *L. brasiliense*, *Chrotopterus auritus*, and *Noctilio albiventris* were other pollen vectors recorded. These species were also seed dispersers, except *L. brasiliense* and *C. auritus*. *Artibeus planirostris* was by far the most abundant bat, and the main seed disperser. Identified pollen species in fecal samples were *Bauhinia ungulata*, *Bauhinia* sp., *Hymenaea courbaril*, *H. stigonocarpa*, *Inga* sp., *Caryocar brasiliense*, *Pseudobombax longiflorum*, and *Psittacanthus corynocephalus*. Seeds identified to be bat-dispersed were *Ficus crocata*, *F. insipida*, *F. luschnathiana*, *F. obtusifolia*, *Maclura tinctoria*, *Piper aduncum*, *P. angustifolium*, *P. tuberculatum*, and *Cecropia pachystachya*. In general, floral resources were approximately three to seven times more frequent in the diet of bats in the Pantanal than elsewhere. The low diversity of food sources and low availability of fruits throughout the prolonged dry season seem to require bats to adopt a more omnivorous diet. The high overlapping among bats regarding floral and fruit sources might affect the success of pollination and seed dispersal to safe sites, which are approaches understudied in the Pantanal.

S23.OC.09

Seed dispersal by bats in French Guiana and the Neotropics

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In the Neotropics, frugivorous bats (Chiroptera: Phyllostomidae) have been reported as the dispersal agents of at least 549 flowering plant species in 191 genera from 62 families. This number, however, accounts for only about 1% of species in the region, some of which may rely on additional seed dispersers besides bats. So, why have fruit bats become synonymous with tropical reforestation? Previous studies have shown both the large quantities of seeds consumed and the relatively good quality of dispersal by bats at single locations, especially in dry forests and secondary wet forests. They also revealed that fruit bats eat a taxonomically non-random subset of fruits with different bat genera specializing on different plant genera, such as *Carollia* on the pioneer genus *Piper* and *Artibeus* on the late-secondary forest species of *Ficus*. The current study incorporates these findings, but takes a flora-level approach. We focus on all available fleshy-fruited plant species in the 140,250-ha rectangle of primary lowland moist forest in central French Guiana and determine which species rely on bats for seed dispersal. By comparing what plant species are available to what are selected by bats, we can develop a better understanding of the role of fruit bats in dispersing seeds in primary forests. We found diaspores of 111 of the 981 fleshy fruited plant species known from central French Guiana in the diets of the 32 obligate and opportunistic frugivorous bat species there. This equates to bat-dispersed species making up 11% of the fleshy-fruited flora. By comparing these results to those from other locations, Barro Colorado Island in particular, we show that bats are important seed dispersers of both pioneer and climax plant species.

S23.OC.10

Interindividual variations in use of space and fruit preferences of the bat *Sturnira lilium* (Chiroptera: Phyllostomidae) in a Cerrado area

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Most ecological studies assume that individuals of the same population behave as equivalents. However, there is growing evidence from dietary studies pointing out that, in many natural populations, individuals use different subsets of the total resource pool. As variations in the foraging behavior of a frugivore may affect the outcome of the seed dispersal process, we tested whether yellow-shouldered bats *Sturnira lilium*, key Neotropical seed dispersers, show evidence of individual specialization in use of space and fruit preferences. To test this hypothesis, we studied a population of *Sturnira lilium* in a savanna (cerrado) in southeastern Brazil. To describe individual patterns of use of space, thirteen bats were radiotracked for seven consecutive nights. To test for interindividual variations in fruit preferences, thirty individuals were submitted to an cafeteria trial, when they were offered fruits of *Solanum variabile*, *Cecropia pachystachya*, and *Piper aduncum*, which belong to the main plant genera consumed by *S. lilium*. We observed interindividual variations in the use of core foraging areas (complementary specialization index H_2'= 0,71), as each bat foraged mainly in a different type of habitat (mainly forests and savannas). The activity of different individuals was positively correlated with the density of different food-plants in each habitat. The cafeteria trials evidenced interindividual differences in fruit preferences (H_2' = 0.09), as although most individuals preferred *S. variabile*, they differed in the consumption of the other fruits. In conclusion, different individuals seem to forage mainly in different kinds of habitat, following the availability of their preferred fruit genera. These findings may be interpreted as preliminary evidence of individual specialization for this bat species, and may have implications for the seed dispersal service rendered by *S. lilium* in the study area.

S23.OC.11

Bat assemblages and parasites under different cattle ranching intensities on Pantanal, Brazil

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Bats have been considered a potential indicator of environmental disturbance as they present wide distribution, high diversity of species, and a great variety of food habits. The Pantanal, world's largest floodplain, have cattle ranching as its economic bases, however little is known about cattle ranching impact on natural communities. In this work we addressed whether the presence of cattle affects bat assemblages composition, richness and diversity, and bat-ectoparasites associations. Nine sites with different cattle use intensities were sampled to assess bat species and their associated ectoparasites. Bats were captured with help of mist nets, identified in field, and inspected for ectoparasites. All ectoparasites were collected and identified in laboratory as flying flies, non flying flies, acari and ticks. All sets of data, bat species composition and ectoparasites composition, were analyzed with a non metric multidimentional scalling technique using the abundance of bat species and ectoparasites groups. Sites with intermediate cattle use intensities presented higher richness and diversity of bats than sites without cattle or sites with the highest intensity of use. Among ectoparasites assemblages, only ticks varied with different cattle use intensities. They were less abundant on bat hosts in sites with intermediate cattle use intensities. Probably cattle intermediate levels of disturbance provide higher heterogeneity on plants and prey insects, leading bats with a richest diet. Changes on bat assemblage on different cattle use intensities reflects changes on other groups, insects and vegetation, reinforcing the importance of bat researches on inferences of the conservation status of the environment. As well as our results show that it is possible to combine conservation issues with economic practices as the intermediate disturbance caused by cattle ranching in Pantanal increases bat assemblage diversity and richness.

S23.OC.12

Differences in bat fly prevalence and mean intensities between Cerrado and Pantanal

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Factors affecting parasitism indexes could be external or intrinsic to the hosts, such as type of shelter, other host-parasite associations, environmental conditions, host mass, fur size, immunological defenses, and grooming ability. The objective here was to evaluate differences on prevalence and mean intensity of parasitism of *Megistopoda aranea* batflies on *Artibeus planirostris* bats in three environments: Cerrado, Pantanal and transition between Cerrado and Pantanal. Bats were mist netted from August 2005 to February of 2006 and their ectoparasites were sampled and collected for identifications in laboratory. We captured 164 individuals of *A. planisrostris* (73 in Cerrado, 57 in Pantanal, and 34 in the transitional site). Batfly prevalence was higher ($p < 0.01$) in the transition area (51%) than in the Cerrado (32.9%) or Pantanal (10.5%). The mean intensity of parasitism did not differ ($p = 0.95$) among the three environments. Cerrado, Pantanal and the transition area presented 2.2, 1.7 and 1.6 ectoparasites per infested bat, respectively. Since there are markedly differences in availability of shelter between the Cerrado and the Pantanal, it is possible that this factor explains the differences in the prevalence of ectoparasites. The absence of differences in mean intensity of *M. araneae* on *A. planirostris* bats may be related to the host grooming ability, which could limit the number of parasite individuals per bat host.

S23.OC.13

Spatial variation in Amazonian bat and bird assemblages under contrasting flooding regimes

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In central Amazonia there are large expanses of forests seasonally flooded by nutrient-rich water (várzea forests) or by nutrient-poor water (igapó forests), which form a mosaic with upland non-flooding forests (terra firme). This variation in flooding patterns and water nutrient load creates a marked spatial heterogeneity in forest structure and floristic composition, expected to strongly influence the structuring of animal communities.
The influence of seasonal inundation and water-nutrient load on the structure of neotropical assemblages of flying vertebrates was investigated. Bat and bird assemblages were sampled with mist nets in central Brazilian Amazonia, across a mosaic of várzea, igapó, and terra firme forests during the low- and high-water seasons. The structure of bat and bird assemblages varied significantly among forest types, but this was mostly due to differences between terra firme and the two seasonally flooded forests. Indeed, despite great differences in productivity due to flooding by either nutrient-rich water in várzea or nutrient-poor water in igapó, bat and bird assemblages in these forests were relatively similar and species-poorer than those of terra firme. This was mostly due to the absence of some species that roost, nest and/or feed on understory plants and/or in the ground. However, while birds were less abundant in seasonally flooded forests, bat abundance in nutrient-rich várzea was significantly higher than in nutrient-poor igapó and unflooded forests. While in bats there were no marked seasonal changes in assemblage structure in none of the habitats, flooding seems to affect bird assemblage dynamics in floodplain forests, with some influx of ground-dwelling species from adjacent upland during the low-water season, and of riverine and aquatic species during floods. Habitat heterogeneity created by seasonal floods and differences in water nutrient load strongly contributes to maintain diverse flying vertebrate assemblages in lowland Amazonia forest landscapes.

S23.OC.14

Frugivore and nectarivore ensambles in riparian habitats in Tropical Dry Forest: Implications for conservation

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Riparian habitat is important for fauna due to the specific composition and structure of the vegetation, as well as the greater resource availability. The majority of information available about bats in riparian habitats has focused on insectivorous bats in temperate regions and clearly documents the importance of riparian zones for this group of animals. The current study expands our knowledge to riparian habitat in a tropical dry forest. Our objective is to document the abundance and species richness of frugivore and nectarivore assemblages in tropical dry forest (TDF) in two types of vegetation: upland dry forest (DF) and riparian forest (RF), and between seasons (i.e., dry and rainy seasons). Additionally, we evaluate whether the structural complexity of the vegetation near flight corridors explains abundance and species richness of the assemblages in both habitats. During 2010 we characterized vegetation and used mist nets to sample bat assemblages in three DF sites and three RF sites in a Neotropical dry forest of the pacific coast of Mexico. We analyzed our results at assemblage, ensemble and population level. Within each level we applied three generalized linear models using as independent factors: a) habitat and season, b) index of vegetation structural complexity (IS) and index of vegetation species composition (IC), and c) IS, IC and percentage of canopy cover (CC). We achieved 72 sampling nights (1800 mist net hours) and 1,094 captures belonging to three subfamilies and 12 species. Frugivores accounted for 77% of captures and nectarivores for 23%. Sampling effort by habitat and season reached 78-91%. Abundance of total frugivores and *A. jamaicensis* was higher in RF than in DF and was positively related to IS and CC when both attributes were included in the model. Abundance of *Artibeus* spp. was positively related to CC. Species composition of assemblage and frugivore ensemble showed positive associations with IS during the dry season. Abundance of assemblage, ensemble and *A. jamaicensis* was higher during the rainy season. We did not find differences in species richness or in species diversity. Our results highlight the importance of RF during the dry season for frugivore ensembles. Conservation efforts in TDF should focus on protecting riparian habitats and assuring connection between adjacent DF and riparian corridors.

S23.OC.15

Use of space by the bat Sturnira lilium (Chiroptera: Phyllostomidae) in a heterogeneous Cerrado area

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Bats of the species *Sturnira lilium* are considered as legitimate seed dispersers in the Neotropics. We still know little about their dispersal efficiency, so data on use of space by these bats are needed. Current studies, carried out mostly in continuous forests, point out to high mobility and low roost fidelity in *S. lilium*. However, as these bats need forest habitats to roost and forage, we hypothesized that in a heterogeneous cerrado area (a mosaic of savannas, gallery forests and plantations), where only a few forest patches are available, *S. lilium* would fly even longer distances and have higher fidelity to day roosts than in continuous areas. To test this hypothesis we radiotracked 13 adult, non-reproductive *S. lilium* (four males and nine females). Bats used large areas, from 4 to 457 ha (110 ± 126.8 ha), and flew commuting distances from 310 to 6.160 m (2.300 ± 1.450 m). Roost fidelity was high in this population: eight individuals used only one day roost, four individuals used two day roosts, and one individual used three day roosts (mean 1.46 ± 0.66). All roosts were located in gallery forests. In most cases, each individual bat flew along the same route every night. Our results corroborate the hypothesis that *S. lilium* bats are able to fly long distances, dispersing seeds over large areas and improving landscape connectivity. The high roost fidelity observed is probably related to the high heterogeneity of the study area, where bats find few suitable day roosts in riparian forest areas. The consistent movement patterns observed suggests that *S. lilium* bats in the area follow a trapline foraging strategy, which may increase foraging efficiency.

S23.OC.16

Why do females hang loose?

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Sex ratios of vines in the cucurbit subtribe Guraniinae are usually highly male-biased. Male-biased sex ratios result from size-related sex expression: small vines are male; large vines are female. Given the fitness advantage associated with being female in a population with a male-biased sex ratio, vines should change sex (from male to female) as soon as possible. Why don't they switch sex at smaller sizes? What is the cost of femaleness? One hypothesis is that "hanging loose" is the cost of femaleness. Vines in the Guraniinae are highly sexually dimorphic: males climb and females don't climb. Females hang loose. Why? Perhaps fruiting branches that hang loose are more conspicuous to bats that use echolocation to search for fruit? Elizabeth Kalko and I tested that hypothesis. We discovered that *Phyllostomas hastatus* and *P. discolor* ignore olfactory cues and use echolocation to locate fruit. As everyone who knew Elisabeth knows, she was (to use her wonderful words) "wildly enthusiastic" about the project and- as everyone (even those who never had a chance to meet Eli) knows- her energy, enthusiasm, talent, and dedication helped us learn more about nature.

S23.OC.17

Phyllostomid bats protein gut analysis by SDS-PAGE and their implication on feeding ecology

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The high diversity of feeding habits of phyllostomid bats is unique among mammals, and it may explain coexistence of multiple phyllostomid species. Animal diet compositions have been found to be associated to gut protein composition. In this study we asked whether the composition of gut proteins of phyllostomid species is related to bat lineages. We removed guts of collected specimens of 16 species (*Anoura caudifer, Artibeus lituratus, A. planirostris, Carollia perspicillata, Chiroderma doriae, Desmodus rotundus, Glossophaga soricina, Lophostoma brasiliense, Micronycteris minuta, Phyllostomus discolor, Platyrrhinus helleri, P. lineatus, Pygoderma bilabiatum, Sturnira lilium, Tonatia bidens, Vampyressa pusilla*) to record presence and quantity of different proteins, then calculated similarity distances of protein compositions for all pairs of bat species. Based on literature, we also measured phylogenetic distances between pairs of species. According to the composition of gut proteins, were more similar, *L. brasiliense* (Phyllostominae), *C. perspicillata* (Carolliinae) and *G. soricina* (Glossophaginae), as well as *S. lilium*, *C. doriae* and *A. lituratus* (Stenodermatinae), followed by *V. pusilla* and *P. lineatus* (Stenodermatinae) and *T. bidens* (Phyllostominae), *A. caudifer* (Glossophaginae) and *P. helleri* (Stenodermatinae). *A. caudifer* and *P. helleri* are identical about the composition of proteins but phylogenetically distant. *A. planirostris* (Stenodermatinae), *D. rotundus* (Desmodontinae), *M. minuta* (Phyllostominae) and *P. bilabiatum* (Stenodermatinae) were different from other species. Although there are similarity among some species of subfamily Stenodermatinae, we did not found correlation ($p = 0.6$, $r = -0.047$; Mantel test) between the protein similarity distances and phylogenetic distances.Therefore, in spite of phylogenetically close species have more similar traits, this is not the case for composition of gut proteins in phyllostomid bats. Since composition of gut proteins does not seem to be conserved through phyllostomid lineages, competition for food resources may be low or absent between phylogenetically close, more similar species.

S23.OC.18

GLOBAL PATTERNS OF PHYLOGENETIC TURNOVER IN BATS

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In community phylogenetics, a recurring and hard to solve issue is how to define the boundaries of assemblages, as well as the regional species pool. Moreover, it is recognized that the subjectivity to define both boundaries and regional pools can affect the power of community phylogenetic methods to detect nonrandom patterns of faunal similarity. Phylobetadiversity (PBD) offers a complementary approach to resolve this problem, because it can elucidate the degree of connectivity that has existed among regions, as well as provides information about how deep in evolutionary time these lineages had been separated. The degree of connectivity also depends on the taxon-specific dispersal abilities. For groups with high dispersal capacity, such as bats, there should be more connectivity and fewer PBD. Here, we investigated the patterns of bat phylogenetic turnover among biogeographic regions. We used a supertree available for most species of the order, and species distribution data. We calculated PBD between pairs of biogeographic regions using 1 - phylosor index, which measures the fraction of branch-length shared between two assemblages. We also calculated standard Sorensen coefficients and then we performed a cluster analyses for both dissimilarity matrices. The most striking dissimilarity was between the Old and New World “phylogenetic composition”, indicating that the major biogeographical barrier for bats dispersal during the early Cenozoic was the longitudinal separation caused by the formation of the Atlantic Ocean. On the other hand, considering the level of dissimilarity used in regionalization analyses made with genera composition (47%), the Neotropic and Neartic, as well as Paleartic and Indo-Malaysian should be considered the same regional pool in phylogenetic terms. This is related to the high dispersal capacity of bats and emphasizes the efficiency of this approach to capture the peculiarities of the evolutionary history of each group to define regional species pool.

S23.P.01

Preliminary assessment of the long-term impacts of fragmentation upon Neotropical bats

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In the Neotropics bats constitute a highly diverse and mobile group, responsible for pivotal forest ecosystem services. Their ecological significance and potential to move over extensive areas of fragmented landscapes combined with their local abundance and diversity makes them a well-suited group to examine the effects of fragmentation. Although a growing number of studies have examined the response of bat assemblages to fragmentation, these have generally been short-term projects that neglect time-lags, system history, temporal variation in resource quantity and quality and other time-related complexities. Consequently, little is known about bat responses to habitat fragmentation in the longer term.

The objective of this study, conducted at the Biological Dynamics of Forest Fragment Project in the Brazilian Amazon, is to elucidate temporal changes in the bat fauna in the last 15-years. For this, we surveyed bat assemblages in six forest fragments (three of 1-ha and three of 10-ha) and in six corresponding plots in continuous forest in 1996-99 and have resurveyed the same sites in 2011-2012 employing identical methods. We hypothesize that fragment assemblages should be less stable through time than assemblages in continuous forest sites.

During the first period 3149 bats representing 41 species were captured, whereas in the ongoing survey 587 bats representing 28 species have already been captured. Capture rates have roughly doubled from the first to the second period (0.146 to 0.312 bats/mnh) and in both periods species richness and number of captures were consistently higher in 10-ha fragments than in 1-ha fragments. Differences in species richness and capture rates were more pronounced among fragments than among continuous forest sites. Between both study periods, within-site differences in species richness were greater in fragments than in continuous forest, indicating that when compared with continuous habitat, fragment assemblages tend to be hyperdynamic.

S23.P.02

Are caves the dead ends for seeds dispersed by frugivore bats?

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Caves are inhospitable places to recruitment of green plants due to low light levels. Therefore, seeds dispersed inside caves by frugivore bats will succumb, unless a second event of dispersal could rescue them. We investigated how many seeds of different plant species are dispersed by frugivore bats inside a cave in the Amazon and whether seeds could be dispersed secondarily by water course coming out of cave. From 13 to 18 December of 2010, we measured seed arrival on the ground and in the water course using 60 seed traps suspended from the ground and systematically distributed inside the cave. Additionally, we installed 3 seed baskets inside water to collect seeds coming out of cave. We collected 714 seeds of 11 morfospecies in seed traps. Ground seed traps (47 traps) collected 521 seeds (10 species); while water seed traps (23 traps) collected 193 seeds (6 species). Seed density was not different between ground and water seed traps ($t=1.24$, $p=0.22$). *Banara* sp. was the morfospecies more abundant followed by *Cecropia* spp, *Solanum* spp and *Vismia* spp. We estimated that ground received *ca*. 968,082 seeds while water course received *ca*. 248,472 seeds in these five days. In seed baskets, we collected 1751 seeds of 7 morfospecies. *Cecropia* spp. was the most abundant species followed by *Banara* sp. and *Vismia* spp. An ongoing experiment shows that most seeds are viable. This is the first study documenting seed dispersal by frugivore bats inside caves. Caves could be sinks of a huge quantity of seeds dispersed by frugivore bats and sources of viable seeds dispersed secondarily by water course. Therefore, caves are not the dead ends for seeds dispersed by frugivore bats, unless seeds could be rescued by nonstandard means of dispersal such as hidrochory and dispersed to river margins where they could recruit successfully.

S23.P.03

Predation risk effects of predator identity on the foraging behaviours of frugivorous bats

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Predators affect directly or indirectly the density and the behavior of prey. These effects may potentially cascade down to lower trophic levels. In this study, we tested the effects of predator calls (playbacks of bird vocalizations: *Tyto alba*, *Speotyto cunicularia*, and *Vanellus chilensis*), predator visual stimuli (taxidermized birds) and interactions, on the behavior of frugivore phyllostomid bats in the field. In addition, we tested if the effects of predation risk cascade down to other trophic levels by measuring rates of seed dispersal of the tree *Muntingia calabura*. Using video recording, we found that bats significantly decreased the foraging frequency on trees when visual cues of *T. alba* were present. However, no stimuli of other predatory birds, including vocalization of *T. alba*, affected bat behavior. There was a change in bat behavior during seven minutes, but then their frequency of activity gradually increased. Consequently, the presence of *T. alba* decreased the rate of seed removal by 46%. These results indicate that risk sensitivity of frugivores phyllostomid bat depends on predator identity and presence. Among the predators used in this study, only *T. alba* is an effective bat predator in the Neotropics. Sound stimuli of *T. alba* seem not to be a cue of predation risk, possibly because their vocalizations are only used for intraspecific communication, such as familial interactions, reproductive either/or territorial demarcation. This study emphasizes the importance of evaluating different predator stimuli on the behavior of vertebrates, as well as the effects of these stimuli on trait-mediated trophic cascades.

S23.P.04

BATS ENSURE POLLINATION OF *Bauhinia rufa* (Bong.) Steud. (LEGUMINOSAE) IN FRAGMENTED LANDSCAPE OF CERRADO IN SÃO PAULO STATE, SOUTHEASTERN BRAZIL

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The fragmentation process may lead to changes in the mutualistic relationship between plants and animals. The activity of pollinators may be modified by reduction of food resources and by the necessity of increasing foraging area. This scenario often obligate the pollinator to go through disturbed areas, and may lead to a reduction in the density of these animals in isolated fragments, resulting in fewer visits and in direct change of the fruit and seeds production. However, positive effects of fragmentation were registered for some pollinator groups. Considering the mentioned aspects, this work aimed to evaluate the behavior and the frequency of bat visits to flowers of *Bauhinia rufa* (Leguminosae) in six fragments of cerrado in São Paulo state. Two classes of fragment sizes, small (three fragments ≤ 60 ha) and large (three fragments ≥180 ha) were compared. The behavior of floral visitors and frequency of visits were registered between 8:00pm and 12:00am, by direct visual observations, video and photography records. The observations were performed simultaneously in one small and one large fragment from the same region, each night, totaling ca. 30 hours of observation using focal method on 12 plants. Two bat species, *Glossophaga soricina* (Pallas) and *Phyllostomus discolor* Wagner, were observed in all the six fragments visiting flowers of *B. rufa* in a legitimate way, transferring pollen to stigmatic surface during the receptive period. The *t*-test was performed to compare the mean frequencies of visits per plant between small and large fragments. This comparison did not show significant differences ($t = 0.7980$, $p = 0.4434$). Both bat species have almost no restrictions to cross physical barriers, to use a variety of local shelter and food. This ability may allow an equivalent number of visits in both, smaller and larger fragments, which may guarantee pollination in this fragmented landscape.

S23.P.05

Bats contribute to the germination of *Cecropia pachystachya* seeds

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Fruit-eating bats can forage on either ripe or unripe fruits of some plant species, markedly on *Cecropia pachystachya* (Urticaceae). Here we address the role of *Artibeus lituratus* (Phyllostomidae) bats to the process of seed germination comparatively between seeds from ripe and unripe fruits of *C. pachystachya*. We fed captive bats (n = 60) in alternate days with ripe or unripe fresh infructescences collected from 10 trees, then we collected their feces and separated and stored the seeds in glycerin. We concomitantly collected additional seeds directly from parts of the same infructescences and also stored these seeds in glycerin. Seeds from each treatment (feces of unripe fruits, feces of ripe fruits, directly of unripe fruits, and directly of ripe fruits) were submitted to germination tests under equal photoperiod, temperature and humidity. Percentage of germinated seeds was higher for ripe than unripe *C. pachystachya* fruits, either for seeds passed (64.86 %) or not passed (68.70 %) through *A. lituratus* guts. Seeds from unripe fruits collected in bat's feces germinated faster than those unripe directly collected from fruits, averaging 6.67 and 7.75 days respectively. The velocity of germination was higher for seeds from ripe fruits passed through bats (4.48 % per day), than for the other three treatments (0.38 to 3.84 % per day). Time of seed storage was positively related to the velocity of germination, irrespective to fruit maturity stage or passage through the bats. Overall results support that passage through bats increases the germination success of seeds from both ripe and unripe fruits, which confers a high potential of *A. lituratus* as seed disperser of *C. pachystachya*.

S23.P.06

The use of Phyllostomids bats as indicators of habitat disruption in a Tropical Dry Forest

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The aim of this study was to test the hypothesis that Phyllostomids bats are good indicators of habitat disruption in a Tropical Dry Forest. For this purpose, four successional stages (pasture, early, intermediate and late) were sampled within and around the Mata Seca State Park, southeastern Brazil. Bats were sampled in three sites representing each of the four successional stages during eight periods between 2007 and 2009. The abundance, richness and relative proportion of bats and of each phyllostomid subfamily were compared between successional stages. We sampled 487 individuals belonging 16 species and six subfamilies of phyllostomid bats. Species abundance varied from 132 (*Artibeus planirostris*) to two individuals (*Chotopterus auritus*). Late forest areas had higher abundance of bats, but richness did not vary between successional stages. The relative proportion of the Glossophaginea subfamily, in this study represented only by Glossophaga soricina, varied between successional stage , being higher in intermediate areas. The abundance of this subfamily was higher in late areas (p=0,015). The same pattern of abundance was detected for Stenodermatinae subfamily (p=0,010). The other sampled subfamilies were Carollinae, Desmodontinae, Lonchophyllinae and Phyllostominae, and their abundances did not vary between successional stages. The use of phyllostomid bats as indicators of environmental preservation was tested many times in different habitats with mixed results. Our results suggest that the Phyllostomidae subfamily is not a good indicator of habitat disruption in Tropical Dry Forests, since some sub-families such as Stenodermatinae are typical from disturbed habitats but were more abundant in late successional stage in our study. Thus, the use of phyllostomids as bioindicators must be considered with caution, especially in Brazil where the ecological knowledge on this group is still scarce.

S23.P.07

Feeding habits divergence and the composition of phyllostomid bat assemblages in the Cerrado-Pantanal savannas

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Evolutionary divergence of feeding habits among phyllostomid bats has been pointed out as one factor which allows co-occurrence of several species. If so, phyllostomid assemblages should vary according to the presence and abundance of different food sources, which supply different bat species. We evaluate whether the food composition of fruit and flower species and of orders of arthropods can determine the composition of phyllostomid assemblages through eight sites in the Pantanal-Cerrado gradient, Brazil. Four sites in the Pantanal and four in the Cerrado were sampled to record phyllostomid species, the mass of arthropod orders, and the number of plant individuals with flowers or fruits known to be used as food by the bats. Consumption of each food item was checked out through inspection of seeds, pollen and arthropod pieces in fecal samples. The most relatively abundant bats were *Artibeus planirostris*, *Platyrrhinus lineatus*, *Carollia perspicillata*, *Glossophaga soricina* and *Sturnira lilium*. Abundances of the first two species positively varied as fruiting trees of *Ficus* spp. and *Cecropia pachystachya* increased, and abundances of *C. perspicillata* and *S. lilium* increased with increasing number of fruiting individuals of *Piper* spp. Abundance of *G. soricina* increased with increasing number of flowering trees and increasing mass of lepidopterans. Bat assemblage composition among study sites was highly correlated to the composition of available food items ($R^2 = 0.73$; $p = 0.007$). In addition, the composition of food items consumed (assembled in fecal samples) in each site was also highly correlated to the composition of available items ($R^2 = 0.97$; $p < 0.001$). Therefore, composition and abundance of food sources determine, to a large extent, the occurrence and local abundance of phyllostomid species through the Cerrado-Pantanal gradient. This finding supports that feeding specialization is a key factor for co-occurrence among phyllostomid bats.

S23.P.08

Influence of vegetation structure on a bat community in the South Pantanal floodplain, Brazil

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The structure of the vegetation tends to affect the patterns of richness and species composition of Neotropical bats. In order to understand how communities respond to changes in local structure, it is essential to first estimate the possible effects of environmental change on these communities. The objective of this study was to analyze the influence of vegetation structure in the species richness, composition and functional diversity in a bat community in the Pantanal wetland. We captured bats using mist nets, and quantified the structural variables of vegetation: distance among trees, diameter to soil's level, canopy cover and density of understory. This was done for 36 sample units. The species richness, number of trophic guilds, and the orthogonal axis relative to the ordination of the sample units in relation to bat species composition were correlated to the orthogonal axis relative to the vegetation structure, to indicate the influence of vegetation structure on the bat community. Although the vegetation structure did not influence the bat species richness, it did influence species composition and number of guilds, with a tendency for the loss of functional diversity in open habitats. The forests and savannas were used mainly by phyllostomids of different trophic guilds, while the open areas were more diverse in aerial insectivores. These results indicate that conversion of forest and savannas in pastures will have a profound effect on the bat community, leading to a loss of phyllostomid species and the ecological functions associated with them, such as seed dispersal and polinization.

S23.P.09

Diversity of bats in the western edge of the Pantanal floodplain, Brazil

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The aim of this paper is to describe the diversity of bats in the western portion of the Pantanal, in the Upper Paraguay River Basin, covering aspects of their distribution and occurrence of habitat. Between February 2008 and November 2009 40 nights of bat captures of were conducted, totalizing 54448 m^2.h within five sample sites in different regions of Pantanal: Nabilique, Paraguay, Abobral, Nhecolândia and Porto Murtinho with different types of landscape. We verified the diversity and constancy of species in the community and registered frugivory by bats captured. We captured 254 bats representing 37 species and six families: Phyllostomidae (19), Vespertilionidae (8), Molossidae (7), Noctilionidae (1) Emballonuridae (1) and Natalidae (1). The most abundant species was *Artibeus planirostris* (31.5%) and *Myotis nigricans* (5.46%), both of which occurred in all sites sampled. The sample site of the Nabileque region presented the highest species richness and diversity with 18 species recorded. The highest similarity was recorded between Abobral and Paraguay sites (S = 0.46). We highlight here important records of occurrence for the Pantanal floodplain region, such as: *Eumops patagonicus*, *Eptesicus diminutus* and *Micronycteris sanborni*. The species cataloged in this study represent 71% of species in south Pantanal. The most common plant species in the feces of bats were *Cecropia pachystachya* and *Ficus crocata*. The community of bats in the Pantanal proved to be rich and diverse, with differences in their composition between the sites of each region, reflecting the complex landscape and different habitats presented in each.

S23.P.10

Resource shared between frugivorous bat (Chiroptera) in urban Cerrado fragments

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The most important determinant of species variety in limited resources environments is the way the species uses and share such resources. Thus, species diversity is greater the greater the sharing of resources. Resembling species coexist when they diversify in at least one niche dimension, for example, space, time or diet, avoiding overlay. Considering the wide distribution of pioneers plants and frugivorous bats, we try to understand how the frugivorous bats share their resources in Cerrado spots of Campo Grande, Mato Grosso do Sul, Brazil. We obtained fecal samples of *Artibeus lituratus, A. planirostris* e *Carollia perspicillata*, the most abundant species of frugivorous bats in these fragments. We cleaned the samples in the laboratory, to sort only the seeds. With the assistance of experts, we identified the seed of each sample at the family level. The composition of seeds varies significantly between the three bat species. In fragmented landscapes this behavior tends to be more pronounced, since there is a reduction of resource availability. We concluded that the frugivorous bats *A. lituratus, A. planirostris* e *C. perspicillata* share Urticaceae, Moraceae, Solanaceae e Piperaceae fruits, thus ensuring the coexistence of these species in urban fragments of Cerrado.

S23.P.11

Bat fauna in an urban forest fragment in the Juiz de Fora municipality, Minas Gerais State, Brazil

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The Atlantic Forest today presents a fragmented landscape where significant parts of the forest remnants are found in urban areas, and are already suffocated by extensive urban matrixes that prevent genic flow among the flora and fauna species. However, many small and medium size municipalities have forest fragments that still retain the connectivity among them, or at least present potential for such connections that guarantee genic flow. In this context are found the forests in the Juiz de Fora municipality, located in the Zona da Mata area of Minas Gerais State, outstanding among which is the Botanical Garden of the Juiz de Fora Federal University, which lies in the Mata do Krambeck (environmentally protected area). Between September 2010 and November 2011, bat captures were carried out deploying mist nets in the Botanical Garden area, the aim being to evaluate the diversity of bat species in the municipality's urban forest remnants. The capture effort, consisting of 13 nights and 75 hours of net exposure, resulted in 152 specimens being captured, distributed among 3 families and 14 species: 11 species of Phyllostomidae, 2 of Vespertilionidae and 1 of Molossidae. The 2 most abundant species were *Sturnira lilium* (N=35) and *Artibeus lituratus* (N=33), followed by *Molossus molossus* (N=19), *Myotis nigricans* (N=14) and *Carollia perspicillata* (N=11). The 9 remaining species each presented capture numbers less than 7. Besides this dominance profile, it is worth highlighting the occurrence of 2 species that are considered rare in the region: *Mycronicteris megalotis* (N=1), *Vampyressa pusilla* (N=1), and a vulnerable species: *Myotis ruber* (N=1). The latter two species cited constitute the sole record in the Juiz de Fora municipality. The results obtained show the importance and potential of this urban forest fragment for the bat community in the Atlantic Forest, in the Minas Gerais State.

S23.P.12

Identification of Suitable Areas in Brazilian Atlantic Forest for the Rare and Threatened Nectar Bat Lonchophylla bokermanni

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Lonchophylla bokermanni is a forest-dependent nectar bat endemic to southeastern Brazil, where it is classified as "Vulnerable" to extinction due to its small and isolated populations and distribution, and extremely fast habitat loss. However, because the species is poorly known and might be rare or widespread, it is "Data Deficient" under the International Union for Conservation of Nature (IUCN). As currently know, *L. bokermanni* has a disjunct distribution, with an interior population in Minas Gerais (MG) state, and coastal populations recently found in the states of Rio de Janeiro (RJ) and Espírito Santo (ES), that might represent a distinct species. In order to identify suitable areas to search for new populations of the species, and taking into account its taxonomic uncertainties, we generated three distribution models using seven bioclimatic variables and the jackknife method within the MaxEnt package and the following presences data sets: (A) all records, (B) MG records, and (C) RJ and ES records. In each model we selected areas with >70% probability of having the species' characteristic environment. Those areas were further refined by removing deforested areas. All models had excellent performances (AUC > 0.9). Models (A) and (C) were similar, selecting ca. 8,000 km^2 of suitable areas on the coast, while model (B) selected 25,000 km^2 of suitable areas in the interior. The removal of deforested areas, however, decreased suitable areas available for *L. bokermanni* in ~ 70% for all models. At the end, we identified highly suitable areas southern to *L. bokermanni*'s currently known distribution range, mostly in São Paulo state, that should be prioritized for the search of new populations of the species. Surveying these potential additional areas for new populations will be essential to finally determine *L. bokermanni*'s "Extent of Occurrence", and then properly assign a conservation status for the species under IUCN.

S23.P.13

Sexual dimorphism and allometry in fruit bats

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Females of Neotropical fruiting-eating bats carry the fetus and/or newborn during great part of their life, which implies additional loading for flight if compared to males. Considering that high wing-loadings (body mass relative to wing area) can reduce ability for flight, we hypothesized that females compensate for offspring loads by increased wings. If so, fruit bats should present allometric sexual dimorphism of wing size in relation to body size. We selected four fruit bats – *Artibeus lituratus*, *A. planirostris*, *Platyrrhinus lineatus* and *Sturnira lilium* – and measured mass, wing area, length of fingers, and other body parts. All selected individuals were adults, and females were not pregnant. *Artibeus lituratus* females (n=29) presented mass of 61.0 ± 13.1g and 357.16 ± 81.09cm^2 of wing area, whereas males (n=20) presented 61.0 ± 13.1g and 357.16 ± 81.09cm^2 of mass and wing area respectively. *Artibeus planirostris* females (n=94) presented mass of 45.8 ± 5.4g and 263.21 ± 35.24cm^2 of wing area, and males (n=144) presented 44.3 ± 4.1g and 251.65 ± 29.82cm^2 of mass and wing area respectively. This species showed sexual dimorphism for mass and wing area. *Platyrrhinus lineatus* females (n=46) presented mass of 24.2 ± 2.1g and 183.16 ± 17.44 cm^2 of wing area, and males (n=43) measured 23.1 ± 2.8 g and 176.63 ± 26.44 cm^2. Females of *S. lilium* (n=18) presented mass of 19.1 ± 2.4g and 132.80 ± 17.05cm^2 of wing area, and males (n=19) presented mass of 20.3 ± 2.2g and 137.97 ± 10.21cm^2 of wing area. Length of fingers and other body measurements of all species did not present sexual dimorphism. The increased female wing area in *A. planirostris* supports our hypothesis of sexual dimorphism, however compensation for offspring loads seems to be not an important selective pressure for the other three species.

S24.OC.01

Molecular Phylogenetics and the Role of Ecology and Geography in Species Diversification of Neotropical *Piper* Subgenus *Ottonia*

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The history and nature of diversification of *Piper* in the New World has been little investigated. Studies of the timing and pattern of diversification of this group may reveal the underlying processes that have lead to high Neotropical diversity of this genus. The *Ottonia* clade is a good starting point as it is a medium size group, of well-defined distribution and known taxonomy. With the aim of understanding the history and nature of diversification of *Ottonia*, we used two different gene regions chloroplast *matK* and nuclear *ITS* to infer a phylogenetic hypothesis and estimate the divergence ages in this lineage. Then, we used this phylogenetic framework to evaluate whether there is a predominant geographical context for speciation and whether there is a significant niche differentiation among sister species pairs. There are two well supported clades in the resulting phylogeny whose divergence occurred in the early Eocene (~50MYa). Clade A has three Amazonian species: *P. humistratum*, *P. alatabaccum*, and *P. bartlinguianum*. Clade B includes all species from the Atlantic Forest and a pair of Amazonia–West of Andes species, *P. piscatorum* and *P. darienense*, an isolated dispersal event dated to early Miocene (~20MYa). All the most recent speciation events date prior to Pleistocene. Geographical analyses suggest that most closely related species frequently overlap substantially their geographic distribution range (with the exception of *P. darienense-P. piscatorum* pair) as predicted under sympatric speciation, however our approach is unable to test alternative hypotheses as peripatric speciation because of the lability of geographical ranges. Finally, there is a significant environmental differentiation only between *P. darienense-P. piscatorum*, suggesting niche divergence accompanied allopatric divergence as predicted under ecological speciation. There is not environmental differentiation between other closely related species pairs. These patterns suggest undetectable past geographic isolation, founder effects, or pollinator isolation are hypotheses to be tested.

S24.OC.02

Chemical ecology of seed dispersal and fruit defense in *Piper*

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Fleshy fruits attract animal seed dispersers by providing nutritional rewards; however, these rewards can also attract fruit pests such as insect seed predators and fungal pathogens. Fruit secondary chemistry is likely of central importance in mediating the triad of interactions among plants, seed dispersers, and fruit pests, and consequently the reproductive success of many plant species. However, few studies have provided any information on the quantitative variation in fruit secondary chemistry or its ecological consequences. I conducted a series of field and lab experiments focused on the role of amides, a large class of N-containing secondary compounds, in the interactions among Neotropical pepper plants (*Piper spp.*, Piperaceae), their primary seed dispersers (bats in the genus *Carollia*), and several associated pests, including insects and fungi. My results show that amides reduce the growth rates of fruit-associated fungi in a dose-dependent manner and have deterrent effects against a specialist insect seed predator, *Sibaria englemani* (Hemiptera, Pentatomidae). In addition, behavioral experiments with three species of *Carollia* bats indicate that amides negatively affect fruit removal and consumption rates by two species (*C. perspicillata* and *C. sowelli*), but do not affect the preferences of a third (*C. castanea*). Of the three bat species, *C. castanea* is the most specialized on *Piper*, which may explain an increased tolerance for amides in this species. Together, these results suggest that amides in *Piper* fruits likely represent an adaptive trade-off between attraction of seed dispersers and defense against pests. Our ongoing work will further explore differences in fruit chemistry among *Piper* species and the importance of this variation in predicting dispersal success. By applying the tools of organic chemistry to better understand the complexities of fruit/frugivore interactions in this model genus, this work can provide valuable insights for both plant defense theory and the evolution of seed dispersal mutualisms.

S24.OC.03

Evaluating pollen flow in *Piper*; are their pollinators lazy or is clonality interfering with mating success?

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Piper is a pan-tropical genus containing over 1000 species representing an ecologically important and often dominant element of the shrub layer or undersoty of tropical forests. Previous studies have revealed strong seed and establishment limitation of sexual recruitment, particularly among shade-tolerant *Piper* species where asexual recruitment seems to be common and perhaps critical for *Piper* population persistence in the understory. However, the proliferation of genetically identical neighbors can interfere with and negatively affect sexual success by raising the potential for self-pollination and self fertilization. The extent of this effect will depend also on how far pollen is moved by pollinators. In this study, we tested the hypothesis that selfing rate increases when the density of genetically identical neighbors increases in *Piper cordulatum*, a self-compatible understory shrub that reproduce both sexually and asexually. We used 12 microsatellites loci to estimate pollen movement distance using a Two-Generation analysis approach and estimated selfing-rates on clonal aggregations and on solitary plants using MLTR (Multilocus Analyses of mating systems**)**. We found that pollen moves remarkably short distances (< 20m) in *Piper*. Given that most clones are found within 10 mts of each other the potential for self-pollination in *P. cordulatum* is high, but we didn't detect significant differences in selfing rates between solitary plants and clonal aggregations, and selfing rate estimates were very low in all cases (< 2%). However, since these estimates were obtained from seedling and not from seeds that were to small for DNA successful extraction, is likely that self-rates are higher. This scenario is further supported by the observation that seeds collected from clonal aggregations had lower germination rates than seeds from solitary plants suggesting that self-seeds are just not able to germinate and asexual proliferation may in fact be reducing sexual success.

S24.OC.04

Linking community phylogenetic and functional diversity with herbivory in a tropical ecosystem

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Despite a general consensus among the scientific community as to the importance of species diversity for ecosystem processes and species interactions, little is known about the underlying mechanisms that link one to the other. For plant-herbivore interactions, it has been observed that when plant species diversity is reduced, loss of primary production to herbivores increases. The mechanisms responsible for these changes in herbivory, however, are still unknown. The most commonly cited hypothesis to explain this pattern is the “resource concentration hypothesis”. This hypothesis states that in more diverse plant assemblages, a particular plant host will have a lower relative abundance and therefore, a lower encounter rate between the plant and its insect herbivores. Nevertheless, taking into account phylogenetic and trait related differences among plant species within a community could become crucial when testing relationships between plant diversity and plant-herbivore interactions. Furthermore, understanding how herbivores with different level of host specialization are affected by changes in plant diversity is still a poorly known phenomenon. Here we used 87 natural multi-species plots of the neotropical genus *Piper* to assess the effect that (1) plant community phylogenetic structure and (2) secondary chemical diversity have on the patterns of leaf damage caused by generalist and specialist herbivores. Damage cause by specialist showed a significant correlation with taxonomic, phylogenetic and chemical diversity however; damage by generalist did not show any significant relationship with diversity. Furthermore, our different measures of diversity (taxonomic, phylogenetic and, chemical) showed significant differences in the amount of variance on the leaf damage explained. Our data suggest that, although changes in the complexity of the plant community have a significant effect on plant-herbivore interactions, this effect is likely to be mediated by the strength of the relationship between herbivores and their plant hosts.

This study contribute to our understanding of how plant phylogenetic structure and trait diversity can affect local trophic interactions as well as the ecological and evolutionary processes that forge plant and herbivore communities.

S24.OC.05

"Complex relationships between host use and diversification across three trophic levels in two Neotropical forests"

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Host-parasite systems have been models for understanding the connection between shifts in resource use and diversification. Despite theoretical expectations, ambiguity remains regarding the frequency and importance of host switches as drivers of speciation in herbivorous insects and their parasitoids. We examine phylogenetic patterns with multiple genetic markers across three trophic levels using a diverse lineage of geometrid moths (*Eois*), specialist braconid parasitoids (*Parapanteles*), and plants in the genus *Piper*. Host-parasite associations are mapped onto phylogenies, and levels of co-speciation are assessed. We find non-random patterns of host use within both the moth and wasp phylogenies. The moth-plant associations in particular, are characterized by small radiations of moths associated with unique host plants in the same geographic area (i.e., closely related moths using the same host plant species). We suggest a model of diversification that emphasizes an interplay of factors including host shifts, vicariance, and adaptation to intra-specific variation within hosts.

S24.OC.06

Metabolic puzzles in *Piper* species

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The metabolomic analysis (^{1}H NMR, HPLC-DAD and PCA) carried out in different developmental stages of seedlings of *Piper* species indicated remarkable changes in composition for few species (*P. gaudichaudianum*, *P. solmsianum* and *P. regnellii*) with clear discrimination between seedling and adult leaves. For these three species, the seedlings were characterized by phenylpropanoids (apiol and dillapiole) while the adult leaves contained meroterpenes (gaudichaudianic acid), tetrahydrofuran lignan (grandisin) and dihydrobenzofuran neolignan (conocarpan), respectively. In contrasts, in case of amide-containing species, the compositions are nearly constant. Such differences during the seedling growth may play important role at the interface with the environment including herbivores. The common predator of *P. gaudichaudianum* and *P. solmsianum/P. regnellii* are the *Naupactus bipes* (Coleoptera) and *Quadrus u-lucida/Heraclydes brasiliensis* (Lepidoptera), respectively.

S25.OC.01

Extrafloral nectaries as biotic defense in plant-insect interaction networks

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Extrafloral nectaries (EFNs) attract natural enemies of herbivores and often provide defense and increased plant fitness. Although much evidence comes from single plant studies, community level information could provide a new dimension concerning the role of EFNs in plant defense. Here, plant protector visitation (i.e. ants), herbivore pressure and attributes of EFNs were studied using the novel approach of interaction networks. At La Mancha, Veracruz, Mexico, we quantified visitation of ant species to plants with EFNs, characterized the glands, and censused lepidopteran larvae feeding on plants (herbivory pressure). We elaborated a quantitative ant-plant-caterpillar interaction network determining topology, connectance and species-level estimates. Ant-plant network was significantly nested while plant-lepidopteran larvae network was highly modular. 53 plant species were attacked by herbivorous caterpillars: 34% of these species had EFNs (66% without EFNs). Controlling by the number of plant species with or without EFNs eaten by larvae, the mean abundance of caterpillars foraging on plants with EFNs was lower than on plants without EFNs (5.89 vs. 8.28), with high interspecific variation (*s.d.* 6.79 vs. 13.85). Average degree (frequency) of caterpillar-plant interactions was lower for plants with EFNs than for plants without EFNs (1.94 vs. 2.22). The maximum caterpillar abundance for a plant species with EFNs was 20 compared to 81 for a plant species without EFNs. The most attacked plants by caterpillars (*Petiveria alliaceae, Cedrela odorata, Cordia dentata* and *Capparis baduca)* had mostly EFNs that are dispersed over plant parts and secrete less nectar, suggesting less benefits offered by visiting ants (in contrast to plants with circumscribed EFNs). The present data suggest that EF nectar production is a biotic defense strategy allowing reduced herbivory at least by a group of insects (i.e. Lepidoptera) that is susceptible to ant deterrence/aggression at their larval stage. Network analysis suggests that EFN attributes are consistent with potential benefits afforded by ants at this community.

S25.OC.02

The influence of extrafloral nectaries on the structure of Cerrado arboreal ant community

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Extrafloral nectaries (EFNs) are very important in ant plant interactions, being present in a large number of plant families, mainly in the tropics. However, little is known about the influence of this resource in the structure of the ant community that uses it, except for a few studies in wet tropical forests. The goal of this work was to test and evaluate the importance of nectar resources in the structure of the ant community in a unique and still understudied savanna biome, the Brazilian *Cerrado*. Two field experiments (a natural and an experimental manipulation) were made in a natural reserve, in Southeastern Brazil. The natural experiment aimed to evaluate the differences in the ant community and the seasonal influence of extrafloral nectar resources in six common Cerrado tree species, three with EFNs, and three without. For this, ants were surveyed during the period of EFN inactivity and again when nectar production was at peak. The experimental manipulation consisted in adding artificial nectaries in two plant species, one with EFNs (*Caryocar brasiliense*), and one without (*Sclerolobium aureum*). The occupation rates of artificial wood nests were measured. There was no significant difference in ant species richness between plants with or without EFNs. Time of the year also did not have an influence on species richness. However, we observed a greater species turnover between sampling periods in plants with EFNs than in those without. The nest occupation rate was significantly higher in *S. aureum* with artificial nectar addition, but this effect was not detected in *C. brasiliense*. Our results challenge previous suggestions that EFNs have a key role in structuring arboreal ant communities. Observed effects of EFNs resources were either subtle (e.g. increased turnover) or not universal (e.g. experimental nectar addition effects on nest occupation rates).

S25.OC.03

Evolution of extrafloral nectaries and ant-plant interactions in Neotropical lianas.

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Considerable attention has been paid to the evolution of functional traits. In particular, much effort has been devoted to a better understanding of the role of extrafloral nectaries (EFNs) for ant-plant-herbivore interactions. Here, we measured quantitative EFN traits in 105 plant species included in a well-supported phylogeny of the tribe Bignonieae (Bignoniaceae), and collected field data on ant-EFN interactions in 32 species. This data allowed us to determine the evolutionary patterns of EFNs in the group, as well as to identify an association between the abundance of EFNs in selected vegetative plant portions where ant visitation (a surrogate of ant guarding) was observed. We further detected an association between the evolution of EFNs and habitat shifts (changes from forest to savannas), as well as identified trade-offs between the evolution of EFNs and other defensive traits (i.e., sticky glandular trichomes). Overall, the evolution of EFNs seems to have been associated with the evolution of new traits and environmental transitions, leading to changes on the cost-benefit of these structures, likely changing the direction of natural selection on EFNs during the evolutionary history of this plant clade.

S25.OC.04

Patterns of host plant use by lepidopterans in the cerrado savanna: Effects from foliage-dwelling ants

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Ants are dominant organisms in tropical ecosystems, and frequently act as generalist predators on foliage. Therefore they can markedly affect host plant use and defense mechanisms in phytophagous insects. For instance, interactions with ants have been demonstrated to determine behavioral traits in Lepidoptera, whose larvae are important consumers of leaves. Many plants possess liquid food sources such as extrafloral nectaries and honeydew-producing Hemiptera. Such plants are intensively visited by ants day and night, especially in ant-rich tropical ecosystems such as the Brazilian cerrado savanna. Previous studies in cerrado have shown that infestation by phytophagous insects on plants bearing ant attractants can be significantly reduced by the ants' deterring traits. However, ant aggressiveness and diet is variable among species and the local composition of ant faunas may affect the magnitude of ant effects on other insects. Thus, one would expect that host plant use and defensive traits of lepidopteran caterpillars would vary spatially in accordance with the level of ant visitation. Here, we surveyed caterpillars using plants with and without ant attractants in four cerrado areas. We also sampled the foliage-dwelling ant faunas by using pitfall traps adapted to arboreal surveys. We found an inverse relationship between ants and caterpillar presence across the localities. We also show that construction of protective shelters is a common trait in caterpillars using highly ant-visited plants. Furthermore, occurrence of caterpillars on plants is affected by the presence of liquid rewards for ants on foliage. The magnitude and direction of this effect, however, vary considerably on a small geographical scale. The specific composition of local ant assemblages likely accounts for such variation. Thus, while lepidopterans probably respond negatively to some ant species (through decreased infestation on plants visited by pugnacious ants), they apparently are not affected by innocuous ant species. (Supported by FAPESP, CNPq, FAEPEX).

S25.OC.05

A mutualistic community of ants, plant and fungi: how a third partner affects plant biotic protection by ants.

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In ant-plant mutualisms, the biotic protection of plants is ensured by the patrolling of ant workers on the leaves. However, because such plant defense emerges from the predatory behavior of the colonies, the biotic protection is considered as a by-product of selfish activities. To meet their need for nitrogen in the restricted foraging environment provided by their host plants, some plant-ants have developed alternative hunting techniques. This is the case for example in ants of the genus *Allomerus*, which cultivate a fungus to build galleries on the stems of their host plants they use as traps. If such predatory strategy enables the capture of prey larger than those the workers could capture on the foliage, it generates, however, a spatial segregation of the workers, which could reduce the conferred benefits to the plants. Here we explore this issue by quantifying several traits of the predatory strategies of two *Allomerus* species coexisting on the same host plant species, *Hirtella physophora*. These two ant species displayed significant differences, with the specialist ant *A. decemarticulatus* preferentially preying in the galleries and the generalist *A. octoarticulatus* on the leaves. Consequently, the plants inhabited by the ant *A. octoacticulatus* were better protected and, thus, experienced a higher vegetative growth and fruit production. Our results suggest that although *A. octoarticulatus* confers greater benefits to *H. physophora*, the higher specialization of *A. decemarticulatus* towards its host plant and the maintenance of positive outcome of their association through reciprocated investment seem to be sufficient to maintain an evolutionary stable interaction. Moreover, providing that the galleries could be used as a proxy of the strength of the fungal association, the integration of such protective mutualism in a larger community context highlights how additional partners may modulate the basic outcomes and the evolutionary mechanisms maintaining a bipartite mutualism.

S25.OC.06

Temporal variation in the abundance and richness of foliage-dwelling ants in the cerrado savanna: extrafloral nectar as a mediating factor

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Arthropod-plant interactions frequently vary in time and space. Extrafloral nectaries (EFNs) are glands that attract ants and other invertebrates that feed on their secretions. Ants protect the plants against the action of herbivores, which they eat, molest or drive away, often resulting in reduced herbivory, thus benefiting the plant. Here, we investigate the temporal variation in the abundance and richness of tree-dwelling ants in a cerrado reserve nearby Uberlândia, MG state, Brazil. Along fifteen 50m-long transects, in the rainy (October to January) and dry season (April to July) of 2010-2011, plants (38 species; 658 individuals) were checked three times per season (day and night) for ant presence and for the occurrence (and activity) of EFNs. Results showed that 17 species (44.7%) and 254 individuals (38.6%) possessed EFNs. In both seasons, EFNs-bearing trees presented higher mean abundance of ants, higher ant species richness, and higher numbers of interactions with ants than plants without EFNs. All parameters, however, were higher in rainy than the dry season (two-way ANOVA, $p<0.05$). A total of 42 ant species were sampled: 40 in the rainy season and 25 in the dry season. Although, no significant difference of ant species composition (NMDS, ANOSIM: $p>0.05$) was found between plants with and without EFNs in either season, EFNs-bearing plants are more visited, especially in the rainy period. Our results are meaningful in view of the pervasiveness of ant-plant-herbivore interactions in cerrado, and enhance the relevance of EFNs as mediators of non-specialized, protective mutualisms with ants in this ecosystem (CNPq, FAPESP, FAEPEX, FAPEMIG).

S25.OC.07

Ecological interactions of a multitrophic association in the Brazilian savanna: floral buds, beetles and wasps.

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Plants are able to defend themselves against herbivores using physical structures, chemicals and biotic defenses. Most studies on herbivory deal with damage on leaves and involves just the second trophic level, usually the third trophic level has been ignored. Here I describe the predatory behavior of *Pachodynerus brevithorax* (Vespidae, Eumeninae) and their effect on larvae of endophytic beetles of *Banisteriopsis malifolia* (Malpighiaceae) floral buds. Observations done during two flowering seasons (2005-2006) inside a natural reserve from central Brazilian savanna, showed that the most important herbivores of B. malifolia floral buds are endophitic coleoptera *Anthonomus rhinozotis*, *A. sulcatus* and *Anthonomus* sp. (Curculionidae Anthonominae). Adults feed on pollen and other plants' parts. Females lay one egg inside floral buds and the larvae feed on the pistil, anthers and petals, making the bud unviable for fructification. Simultaneously, the wasps *P. brevithorax* locate an infested bud, bite its calyx and/or corolla, open a hole and remove the larvae that can be eaten immediately or carried to the nest. Wasps can use plant volatiles, perforating marks on the upper surface of buds and vibration signals produced by the larvae as cues to find an infested bud. Five Malpighiaceae species (*B. malifolia, B. campestris, B. laevifolia, Peixotoa tomentosa* and *Heteropteris pteropetala*) are exploited by *Anthonomus* adults and larvae in the area. However, *P. brevithorax* searches for food only in *B. malifolia* buds, possibly due to the huge number of buds of this species, bigger than the others, and because the time of bud production matches its season for nest provisioning. This plant-beetle-wasp association contributes to the ecology and reproduction of Malpighiaceae species associated with nutritional, ecological and reproductive aspects of endophitic beetles and their predator wasps. The use of Coleoptera larvae to provision the young wasp cells is new information for the genus *Pachodynerus*.

S25.OC.08

Soil quality and herbivory influence on the performance of the shrub Solanum sisymbriifolium (Solanaceae).

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Environmental influence on host plant responses to herbivory has long been investigated, although it is still not completely understood. Plants differ greatly in their foliar concentrations of defense compounds, and there are two hypotheses to explain that: 1. nutrient-rich soil plants are able to compensate herbivore damage ; 2. Plants in low nutrient availability invest in defenses to reduce herbivory and this tradeoff slows growth. The present work investigated the effects of herbivory and different levels of soil conditions (poor or nutrient enriched) on the performance of *Solanum sisymbriifolium* (Solanaceae). An experiment was conducted in an abandoned pasture area in Brazil. For 11 months, two groups of plants were followed, one located on a nutrient poor soil and the other on an enriched soil with organic fertilizer. Monthly, the primary and secondary growth rates of plants, leaf, flower and fruit production and herbivory levels were recorded. In the field, the most frequent herbivores found on *S. sisymbriifolium* were a monophagous Chrysomelidae beetle and an Sphingidae caterpillar. Performance of individuals on both experimental groups changed during the year. Enriched soil plants performed better in the period before the summer, with low herbivory levels, but the opposite trend occurred after the beginning of the summer, when poor soil plants performed better and showed significantly less herbivore damage ($p < 0.05$ for all plant traits). In laboratory experiments, the generalist caterpillar *Spodoptera frugiperda* consumed significantly lower amount of leaves from plants grown on enriched soil than from plants on poor soil ($p<0.001$). Therefore, results suggest that plants growing on enriched soil are able to increase growth rates and be more efficiently protected against generalist herbivores. But since they are intensely consumed by specialist insects (e.g. monophagous Chrysomelidae beetles), such herbivory precludes enhanced performance of *S. sisymbriifolium* in enriched soil conditions.

S25.OC.09

Synchrony of Leaf Production as a Strategy to Escape Herbivory in Tropical Forests

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The growth-defense tradeoff hypothesis predicts that plant species growing in low-resource habitats invest more in defense against natural enemies at the expense of growth or flooding tolerance. Conversely, plant species growing in high-resource habitats would have lower defenses because of lower cost of tissue replacement. Tropical plant are known to exhibited many types of defences against natural ennemies, however very few informations are available on tropical plant phenology in relation with indirect strategy of synchronism.
Yet defenses may include both physical and chemical investments and indirect defenses that permit escape from natural enemies via herbivore satiation (synchronism) or unpredictable phenology of leaf production (time avoidance). We hypothesize that, in high-resource environments, tree species can synchronize or delay leaf production to reduce damage by natural enemies. Inversely, we predict that, in nutrient-poor environments, tree species should invest predominantly in structural defenses such as leaf toughness and thickness.
We tested these predictions by studying tree species phenology and herbivory in two contrasting habitats (*terra firme* clay forest and white sand forest) in the Laussat Conservation Area of French Guiana. We measured leaf production and herbivory rate on five pairs of congeners (Licania, Protium, Inga, Microphis and Pachira) with one species specialized to each habitat. We also measured six leaf functional traits related to growth and herbivore defense.
We found strong correlation between leaf production rate and leaf functional traits, however, we found no correlation between herbivory and leaf production rate.

S25.OC.10

Structural defences against large mammal herbivores in southern African woody plants

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Large vertebrate extinctions occurred in many parts of the world over the last few thousand years. They have left a legacy of structurally defended plants but few of the animals that ate them. Understanding anachronistic defences is hampered by the lack of information on where they are most likely to occur and how they function against different kinds of vertebrate herbivores. Africa, with an intact megafauna, provides opportunities for exploring the distribution of structurally defended plants, how they function and their value as indicators of local abundance of vertebrate herbivores. Here I report on aspects of the ecology of structurally defended plants in the southern African region. The patterns observed may aid in interpreting the consequences of large vertebrate extinctions and in the recognition of plants with anachronistic defences.

S25.OC.11

Ontogenetic switches in plant defense

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Most types of plant defenses have been widely reported to change across ontogeny. However, no general patterns in such changes have been found because ontogenetic trajectories seem to be idiosyncratic to each life-history, ontogenetic stages compared and the type of defenses studied. A less explored possibility of the variation in ontogenetic trajectories is the occurrence of ontogenetic switches in the expression of different defense strategies, which can be promoted by changes in the cost and benefits of each defense at a given ontogenetic stage. We explored the simultaneous change in physical, chemical and biotic resistance and in the ability to tolerate damage throughout the ontogeny of the myrmecophytic shrub *Turnera ulmifolia* in a coastal sand dune of the Gulf of Mexico. We fond non-linear relationships between plant age and thrichome density, leaf toughness, water content and extrafloral nectar production. In general the pre-reproductive and/or reproductive stages were the most defended ones by physical or biotic means. In contrast, we observed that cyanide compounds were present exclusively at the cotyledon and two-leaf stages. Tolerance also varied throughout ontogeny. Genetic variation was detected for the trajectories in trichome density, leaf toughness, and in the production of extrafloral nectar. Ontogenetic variation in herbivore damage was also observed in the field, where the juvenile stage was the most attacked one and the least visited by ants. Hence, we propose that natural selection has favored the expression of different defensive traits at each ontogenetic stage, or in other words, has acted directly on the ontogenetic trajectories of each defensive trait, favoring those that maximize overall plant fitness. The study of how natural selection favors ontogenetic switches in plant defensive traits highlight the importance of studying complex phenotypes to understand the evolution of adaptations, that often are composed by multiple and dynamic traits.

S25.OC.12

Effects of global environmental change on above and below-ground plant-herbivore interactions: a meta-analysis of experimental studies

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In the coming decades, a major form of abiotic variability will originate from anthropogenic climate change. Most studies investigating climate change effects have looked at shifts in species ranges. However, studies looking at how species interactions will respond to climate changes are rare, despite their important potential outcomes. For instance, since plant and herbivore physiological processes are directly dependent on the environment, such changes could have important consequences for plant-herbivore interactions in both above and below-ground subsystems. In this sense, we performed a series of meta-analyses to examine the importance of environmental sources of variation in the above and below-ground plant-herbivore interactions worldwide. More specifically, we looked at the difference in plant defense properties between both subsystems in relation to resource variation and herbivory rates. We found that the environmental variation affects both above and belowground interactions, influencing plant defenses in both subsystems. It was also evident that, to date, the majority of ecological studies of plant-herbivore interactions have only explored aboveground interactions. In doing so, they overlook the diverse fauna of belowground herbivores and their far-reaching impacts. From these aboveground studies, a considerable number was based in the CO_2 and temperature effects on plant defenses. In addition, water - an important factor in both subsystems - has not been explored as a possible major resource affecting above and belowground plant defenses. Furthermore, most belowground interaction studies make assumptions based on the functioning of aboveground subsystems, but rarely test those assumptions. We conclude emphasizing that although belowground plant-herbivore interaction issues have been addressed more frequently in recent years, the number of empirical studies looking at defenses on roots is still surprisingly low, regardless of their importance for the community as a whole. Thus, any future inferences regarding plant-herbivore interaction predictions, theories and hypotheses should be properly addressed in belowground subsystems.

S25.OC.13

Host plant extinctions and insect herbivore coextinctions in a tropical elevational gradient

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One overlooked driver of biodiversity loss is co-extinction: the loss of species as a result of the extinction of species upon which they depended. Global warming is expected to increase extinction rates in elevational gradients. However, the effects of climate change on biodiversity loss through co-extinctions at different elevations remain unknown. One group of organisms that is highly susceptible to co-extinctions is insect herbivores because their life cycles are closely bound to their host plants. Under projected climate change, tropical plants will rely on altitudinal migrations to persist. Insect herbivore distributions will be affected by both climate and host plant distribution changes. This project evaluates host plant extinctions and cascades of associated insect herbivore co-extinctions under projected climate change in a tropical altitudinal gradient (Barva transect, Costa Rica). We used plants from the order Zingiberales and their insect herbivores, *Cephaloleia* beetles, as our study system. We are compiling the following datasets to model cascades of insect herbivore co-extinctions under projected climate change: (1) plant and insect herbivore altitudinal distributions and (2) insect herbivore diets. We are determining plant-herbivore associations by (A) amplifying plant DNA barcodes (rbcL, trnH-psbA, ITS) from insect gut contents and (B) field observations. Here we explore the following questions: (1) Are specialized herbivores more vulnerable to coextinctions than generalists? (2) Are diet breadths of insect herbivores reduced at high elevations? And (3) Are insect herbivores more susceptible to extinctions at higher elevations? By combining field records with extinction simulations we conclude that diet breadths are reduced with elevation. Narrow diet breadths of herbivores at high elevations increase their risks of extinction if their host plants disappear.

S25.OC.14

PacBio sequencing of plant-insect interactions: How does secondary chemistry influence host-use among the herbivores of congeneric plants?

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Many tropical forests contain diverse assemblages of congeneric trees, which raises the question of how ecologically similar species can avoid competitive exclusion. Negative density-dependent fitness imposed by specialized natural enemies (i.e. the Janzen-Connell hypothesis) is a broadly accepted mechanism of species coexistence. Specialist herbivores, however, often specialize on a particular genus, not species, of plants. On the other hand, plant defenses can be quite divergent among closely related sympatric species. Herbivore-driven spatial overdispersion of such defense traits might allow a Janzen-Connell-like mechanism to facilitate coexistence within local assemblages. We examine the specificity of interactions between herbivorous insects and their host-plants among 21 sympatric species of the diverse tropical shrub genus *Psychotria* (Rubiaceae) on Barro Colorado Island (BCI), Panama. We employ next-generation DNA sequencing of plant and insect DNA barcodes to identify stomach contents of putative herbivores of *Psychotria*. This network of plant-insect associations is combined with profiles of *Psychotria* secondary compounds and mechanical leaf traits within the framework of a hierarchical Bayesian model to infer the degree to which particular defense traits predict the association between *Psychotria* and their herbivores. We address three principal questions: i) how specialized are the insect herbivores of a single, diverse plant genus? ii) do *Psychotria* defenses show evidence of evolutionary divergence? and iii) do *Psychotria* species assemblages reveal evidence of limited similarity in defense traits and/or herbivore affinity?

Results indicate that the insect herbivores of *Psychotria* on BCI are not strict specialists. Nevertheless, while species of *Psychotria* that co-occur within 28 m^2 plots are more closely related than by chance relative to the BCI species pool (i.e. are phylogenetically clustered), they are less similar with respect to secondary compounds than random. Evolutionary divergence in defense may facilitate coexistence within assemblages of congeneric species by reducing herbivore overlap between close relatives.

S25.OC.15

Phylogenetic and ecological determinants of plant-herbivore food webs in tropical forests

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We examined the structure of complex food webs between plants and herbivorous insects, using quantitative surveys of food webs along succession and altitudinal gradients in tropical forests of New Guinea. Further, we used critical ecological traits and phylogenetic relationships of host plant species to explain the species richness, host specificity and trophic interaction structure in their herbivorous assemblages. Finally, we also tested the functional aspects of food webs by manipulative experiments in tropical forests. These studies made it possible to explore the importance of food web structure for the maintenance of extraordinary diversity of both plants and insects in tropical forests. We examined the structure of complex food webs between plants and herbivorous insects, using quantitative surveys of food webs along succession and altitudinal gradients in tropical forests of New Guinea.

S25.OC.16

The strength and diversity of plant-herbivore interactions and the evolution of ecological divergence by trees across habitat gradients in Amazonian forests

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Natural enemies are often implicated in the generation of the extraordinarily diverse tropical flora. Classic hypotheses linking enemies to plant diversification posit the evolution of novel defenses allows plants to escape their enemies and expand their ranges. When range expansion involves entering a new habitat type, this could accelerate defense evolution if habitats contain different assemblages of natural enemies or divergent resource availabilities affecting plant defense allocation. We tested this idea investigating two sister lineages of habitat specialist morphotypes of *Protium subserratum* (Burseraceae) a common Amazonian tree that occurs in white-sand as well as clay and brown-sand (terra firme) forests. We sampled multiple populations of both lineages for defense chemistry, collected insect herbivores feeding on the plants, and assessed whether phenotypic and performance differences between habitats were genetically-based using a reciprocal transplant experiment. Differences in growth rates and defense strategies differed between lineages, consistent with the existence of an allocation tradeoff to growth versus defense. Populations from terra firme habitats grew significantly faster than white-sand populations; they were taller and produced more leaf area, with more chloroplasts. White-sand populations had significantly tougher leaves and expressed more dry weight of secondary compounds than terra firme populations. White-sand populations expressed more flavone glycosides and an acetylated form of squalene, whereas terra firme populations produced a coumarylquinic acid that was absent from white-sand populations. Beta-diversity of insect herbivores collected from populations in the two habitats was extremely high both between habitats and sites of the same habitat type 100-km distant. We interpret these results as strong evidence that natural enemies and resource availability select for divergent defense strategies in white-sand and terra firme lineages of *Protium subserratum*. Both the types and amounts of defense investment differ, and likely represent the results of divergent selection that contributes to habitat-mediated speciation in these trees.

S25.OC.17

Herbivore-driven plant speciation in tropical forests, a return to Ehrlich and Raven

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Ehrlich and Raven, in their seminal 1964 paper on coevolution, first proposed that insect herbivores and their host plants might be engaged in reciprocal evolutionary change. Speciation would be driven via the evolution of plant defenses against insect herbivores, and counter-adaptations by the insects in response. Ehrlich and Raven also proposed that the resulting speciation processes would be more likely to occur in tropical rather than in temperate habitats. No specific mechanisms were proposed for how such interactions might lead to speciation. Although there are a number of examples of plant-driven speciation in insects, the impacts of herbivores on plant speciation have been overlooked. Drawing upon our own research and that of others, we describe possible mechanisms by which insect herbivores might drive speciation in plants. We suggest three mechanisms by which plant-herbivore interactions could lead to reproductive isolation in plants: changes in plant reproductive traits, facilitation of habitat colonization, and reinforcement of species boundaries via hybrid depression. In addition, we review evidence that the frequency of interactions leading to plant speciation might be higher in tropical forest habitats. Our conclusion is that it is possible for herbivores to instigate, cause, and reinforce plant speciation, and that these processes could be more frequent in tropical versus temperate habitats. Our understanding of the nature of these processes, however, is in its infancy.

S25.OC.18

Macroevolution and the Diversity of Plants and Herbivores

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A confluence of phylogenetic, ecological and genetic studies has begun to evaluate the suggestion (by Ehrlich and Raven 1964) that a history of "escape-and-radiate" coevolution has contributed to the diversification of plants and insects. The evidence is still sparse, but lends some support to parts of this hypothesis. I will summarize the principal lines of evidence and suggest directions of possibly fruitful inquiry.

S25.P.01

Morphological and histological characterization of extrafloral nectaries and associated ants in a Mexican rain forest

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Extrafloral nectaries (EFNs) are glands that produce sugary exudates attractive to ants that can be located at any vegetative or reproductive structure of the plant. In the leaves they may occur on the petioles, rachis, on the upper- or under-side of the leaf blade, leaf margin or on the stipules that may be present in young branches, next to the nodes, and in some species on the cotyledons. The EFNs may also occur in inflorescences and flowers, but are not directly involved with pollination. This study was conducted in the tropical rain forest at Los Tuxtlas, Veracruz, Mexico. In this study we focused on determining the identity and species richness of plants with EFNs, and to determine the EFNs morphologies and histological characteristics represented at this site. We found 50 plant species in the studied area with EFNs (16 families, 32 genera), which correspond approximately to 5% of the flora reported for this site (943 species). Trees were the life form with the greatest representation of EFNs while shrubs and epiphytes had the least representation. We found six different morphological types of EFNs (elevated, hollow, formless, pit, scale-like trichomes and flattened). Dissimilarity analyses detected 31 species of ants (14 genera) associated to 29 plant species. Associations between 29 plant species and ants showed three major groups, in which the most dissimilar group was Fabaceae. At this time we are carrying on a study to determine the specificity of ant-plant interactions throughout the year, exploring possible differences in sugar types, to determine if a phylogenetic component present in this interaction. This information will provide the basis for future research in the field of plant-animal interactions in tropical rain forests, which can be explored from an ecological and chemical perspective.

S25.P.02

Phenological variation and its impact on florivory in a Cerrado Malpighiaceae community.

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Plant-insects interactions are very old and abundant on the basis of tropic chains in terrestrial environments and there are many short time studies focusing on interactions of a single plant species and its animals. Long time studies about multitrophic and multispecies systems are very rare. We investigated how sequential phenological variation during time influence ecological defense against floral herbivores in Brazilian Savanna Malpighiaceae. *Peixotoa tomentosa* A.Juss., *Banistriopsis laevifolia* A.Juss, *Banisteriopsis campestris* A.Juss. and *Banisteriopsis malifolia* Ness & Martius were investigated in an ecological reserve from central Brazil, during the flowering periods between May 2008 to June 2009. Plant phenology and herbivory were observed. The richness and abundance of ants and herbivores were recorded on 30 similar shrubs, 15 in natural conditions and 15 with ants excluded. Floral buds and fruit set produced were quantified. The four species had sequential flowering with small overlapping periods. Cluster analysis indicated the plant species have an herbivory guild (32 species) and ant species (22) both distributed in a nested way. Ants reduced herbivory damage in the foliage, but not in the reproductive structures. Each species had a main and a secondary herbivore group. Thysanoptera was the main herbivore of *P. tomentosa* with and without ants, but secondary herbivores varied. Endophitic Curculionidae beetles were the principal herbivore of *B. laevifolia* with and without ants, secondary herbivores were observed mainly in the ant-excluded treatments. *B. campestris* and *B. malifolia* had as main herbivore the Hemiptera Coccoidea associated with ants and more abundant in control individuals, secondary herbivores for both plant species were observed mainly in ant-excluded treatments. The Malpighiaceae system observed here had sequential flowering benefiting the guild of generalistic herbivores and permitting their coexistence in the same area/time. All the main herbivores presented a special relation with ants, or avoiding or benefiting from them.

S25.P.03

Spatial variation in herbivory rates on a Neotropical ant-plant (*Tococa guianensis*)

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Tococa guianensis is a Neotropical ant-plant associated with ants of the genus *Allomerus* and *Azteca*, which are effective in defending their host-plants against insect herbivores. However, near to the limit of its southern distribution, isolated *T. guianensis* populations were found to persist despite the local absence of *Allomerus* and *Azteca* (hereafter obligate ants). Several hypotheses were proposed to explain the long-term persistence of these populations. One is that opportunistic ants fulfill–at least partially – the role played by obligate ants. The other is that leaf trichomes (whose density is greater in plants without obligate ants) prevent herbivory. Finally, there is the possibility that herbivore pressure is simply too low where obligate ants do not occur. We performed a factorial experiment in three different sites (two with and one without obligate ants) manipulating the presence of ants (with ants or ants removed) and the density of trichomes (intact or shaved leaves). Herbivory rates were then measured for a period of four months on leaves produced after the beginning of the experiment. Trichomes did not significantly affect herbivory in any of the three sites and there was no interaction between the ant treatment and trichomes. Opportunistic ants also did not affect herbivory rates in the site where obligate ants are not present. Obligate ants did have a strong effect on herbivory rates in one site but – surprisingly – not in the other. In this latter site herbivory rates were very low regardless obligate ants were removed or not. Overall, our results indicate the existence of substantial variation in herbivore pressure among plant populations established in different locations. This may help to explain the existence of populations without mutualistic (obligate) ants. Our results also indicate that the there is strong spatial variability in the benefits accrued by ant-plants from their obligate ant associates.

S25.P.04

Chemical protection and nutritional value of *Ficus pertusa* and *Cecropia pachystachya* infructescences, keystone fruit sources in the Pantanal

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The chemical composition of animal-dispersed fruits can vary throughout maturation to prevent consumption prior to seed maturity, and to become more attractive for dispersers when mature. We evaluate the chemical composition of ripe and immature infructescences of *Cecropia pachystachya* and *Ficus pertusa*, keystone species for the Pantanal frugivorous vertebrates. We quantified water, soluble proteins, sugars, lipids, phenol and tannin in ripe and unripe infructescences collected from 28 trees of *C. pachystachya* and five of *F. pertusa* in the Pantanal. Both fruit stages contained more than 70% water, for both species. Ripe fruits had two (*C. pachystachya*) and five (*F. pertusa*) times more sugar than unripe ones; ripe fruits contained 33 and 55% sugar, respectively. Protein dry mass was similar between ripe and unripe *F. pertusa* fruits (~0.17%), but unripe *C. pachystachya* fruits presented three times more protein than ripe fruits (1.0 and 0.28% respectively). Lipids accounted for 3.0 and 3.9% (*C. pachystachya*) and for 2.3 and 3.3% (*F. pertusa*) of the dry mass in unripe and ripe fruits, respectively. The contents of phenols and tannins were higher for *C. pachystachya* than for *F. pertusa*, and higher for unripe than for mature fruits (respectively 6.5 and 3.5% of phenols and 1.3 and 0.8% of tannins in *C. pachystachya*, and 2.5 and 1.3% of phenols and 0.8 and 0.4% of tannins in *F. pertusa*). We conclude that ripe fruits are sugar-rich, but their lipid, protein and water contents are not higher than those found for unripe fruits; and immature *C. pachystachya* fruits are protein-richer than mature ones. Increased phenols and tannins likely protect immature fruits against pre-dispersal herbivores, but the recorded concentrations appear to be too low for effectively repelling vertebrates. Overall, both plant species have some chemical protection of their unripe fruits against herbivores, but do not appear to function against early consumption by vertebrates.

S25.P.05

PHYSIOLOGICAL RESPONSE OF DATE PALM (Phoenix dactylifera. L) TO RED PALM WEEVIL (Rhynchophorus ferrugineus Oliver) BIOTIC STRESS

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Red palm weevil (*Rhynchophorus ferrugineus* Oliver) RPW is a serious insect pest that causes huge damage to date palm trees (Scientific name). The physiological response of date palm trees due to RPW infestations were measured every two weeks for one year from a date palm farm. Infested date palm trees were divided into three levels according to the infestation level (High-Medium-Low). Data showed that, values of the most estimated physiological traits varied according to date palm varieties and level of infestation. The highest infestation level and intercellular CO2 was observed on Khenizi variety, but the lowest infestation level was observed on Zamli, followed by Ruziz abd Barhy varieties. Shibi variety recorded the highest values of external temperature degree. Om-Rahim, Helaly and Barhy varieties recorded the highest readings of chlorophyll content in leaves, leaf temperature and mesophyll conductance, respectively. Zamli and Barhy varieties recorded the highest water use efficiency, but the highest readings of transpiration rate, Internal track temperature and leaves temperature were observed with Fahl, Shahal and Helaly, respectively. Red palm weevil infestation level had marked effects on internal temperature, leaf temperature, transpiration rate, intercellular CO2, stomatal conductance, and mesophyll conductance. The highest readings of leaf temperature, photosynthesis rate, stomatal conductance, water use efficiency and mesophyll conductance recorded from un-infested date palm trees.

S25.P.06

Interaction between *Senegalia tenuifolia* (Mimosoideae) and the dominant seed predator species (Coleoptera: Bruchidae): a preliminary study

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Plant reproduction can be strongly reduced by seed predation. The aim of this study was to test the hypotheses: (I) Fruits with higher biomass show higher abundance of both total seeds and predated seeds, (II) Fruits with more biomass have a higher abundance of beetles. We collected pods in four different forest fragments (A1, A2, B1 and B2) located in southern Minas Gerais, Brazil. Fifteen fruits of *Senegalia tenuifolia* were collected from each fragment. The pods were stored in tubs covered with delicate fabric, and stored for three months. After this period, the predated and not predated seeds were quantified. After drying the seeds and pods we determined the biomass and morphotyped the beetles. Analysis of variance and contrast test were performed. The average biomass of predated seeds in fragments, A1 and A2 were similar and both differed from areas B1 and B2, which means have been different to each other ($F= 19.675$, $p<0.001$). Seed predation differed among areas, with A2, B1 and B2 presenting similar means that differed only from A2 ($F= 15.386$, $p<0.001$). The significant differences in the fruit biomass between areas ($F= 6.930$, $p<0,001$), and the mean A1, A2 and B2 could be grouped by a contrast test because they were similar but differed from B1. The total seed biomass also differed ($F= 10.395$ $p<0.001$) with similar means for A1. A2 and B2. We used GLM to demonstrate that there is a positive relation between the area of the fruit and the total seed biomass ($F= 20.427$, $P<0.001$). The abundance of *Merobruchus terani*, increase as the area of the fruit increases ($F= 7.6155$, $p<0.001$). The impacts that seed predator insects have on *S. tenuifolia* and the pods characteristics varied in the apparently homogeneous area.

S25.P.07

Effect of simulated herbivory in the survival and growth of *Actinocephalus polyanthus* (Eriocaulaceae), a sand dune monocarpic species

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Plant responses to herbivory include compensatory growth and defense. *Actinocephalus polyanthus* (Bong.) Sano suffers intense herbivory by leafcutter ants, in the dunes of Praia da Joaquina, Florianópolis, SC, southern Brazil. This work has evaluated the effect of simulated leaf herbivory on mortality and growth of adults and juveniles of *A. polyanthus*. 48 plants adults and 51 juveniles were distributed into three treatments (50% damage, 90% damage and control), being evaluated by six months. The damage was done once with scissors. The growth rate of the leaf rosette (TCF) and the number of sheaths (TNF) produced after the damage were evaluated. There was no mortality of vegetative plants, and among adults, reproduction occurred in five plants with simulated damage at 50%, in six with 90% and in five plants controls. The TCF (cm2/day) of adult plants with damage of 50% and 90% was 0.09 ± 0.01 and 0.08 ± 0.03, respectively. The TCF of juveniles was 0.06 ± 0.02 and 0.05 ± 0.01, respectively. In both cases there was difference ($p<0.01$) only in relation to the control (adults: 0.01 ± 0.01 and juveniles: 0.01 ± 0.02). The TCF in juvenile individuals and adults on treatment control was similar. Under simulated herbivory, the TCF of adults was 69% higher in the treatment of 50% ($p=0.0014$) and 20% in the treatment of 90% ($p=0.0044$). The TNF did not differ between the damage treatments. Comparative foliar biomass between 50% and 90% treatments were similar in adults and juveniles. The results suggest that herbivory, even intense, does not cause mortality and generates a large response of plant compensation on growth, regardless of the amount of damage to which it was subjected. However this compensatory response differs between the development phases of the plant, being higher in adult plants.

S25.P.08

Edge effects alter plant-herbivore network structure

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Edge effects alter the composition and diversity of ecological communities, but little is known about its impacts on food-web structure. Here, we have evaluated how edge effects modify the structure of plant-herbivore network interactions. We have counted all the interactions observed along four hours in nine plots of $100m^2$, both in edge and forest interior habitats, of a large (3.500 ha) fragment in the Brazilian Atlantic Forest. For each observed interaction we have collected both, the herbivore and the plant. We registered 380 interactions between 171 plant morphospecies and 147 herbivore morphospecies. We observed differences in the species composition and network structure, although species richness has not differed between the habitats. In accordance with our predictions, edge habitats had 48% less network compartments, a 70% increase in connectance, and 25% in the links per species number. We observed a marginally significant difference in niche overlap between habitats, with edge habitats presenting the higher values. Several studies have demonstrated an increase of both generalist herbivores and pioneer plants in edge habitats. Our results amplify this notion by demonstrating that these habitats are dominated by generalist interactions, with the loss of specific interactions. We suggest that this pattern is an outcome of the increase of generalist herbivores in edge habitats due to the escalation of herbivory-tolerant plant species densities. The generalist herbivores abundance outbreak might have a positive feedback with edge-effects, increasing the probability of persistence of pioneer plants, with serious repercussions for conservation.

S25.P.09

The nest density effect and the body size importance for ant-plant interactions

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Habitat fragmentation can alter community structure of ants. Because some ant species are important as seed dispersers, the habitat fragmentation can modify the outcomes of ant-plant interactions. In this study we evaluate the rate and distance of removal of seeds in three fragments of different sizes in semideciduous forest and one pasture. Forty observation stations containing six seeds of *Carica papaya* L were established in each environment. Ant species collected removing seeds were measured for body size. Seventeen species of ants were collected, and 316 seeds were removed (32.92% of total seeds exposed). The removal rate of seeds was significantly higher in the larger forest fragment (60.42 ± 9.7%) when compared to the small size (22.5 ± 9.14%), the medium size (20.8 ± 4.1%), and the pasture (28.3 ± 7.5%) (Tukey, $P < 0.05$). The species that removed most seeds was *Pachycondyla striata* Fr. Smith (53.79% of all seeds removed). This species has a large body size and had high nest density in the larger forest fragment. Average distance of removal was significantly higher in medium size and large size forest fragments (Tukey, $P < 0.05$). The size of the ants were positively related to the distance of seed removal ($R^2 = 0.853$, $n = 10$, $P < 0.01$). *Pachycondyla striata* is important for seed dispersal, and the reduction of its population due to habitat alteration is a threat to the balance of ant-plant interactions in semideciduous forests.
Key words: biodiversity, communities, myrmecochory, Ponerinae.

S25.P.10

Leaf herbivore by leaf-cutting ants reduce female reproductive traits of Miconia nervosa (Sw.) Triana (Melastomataceae)

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Leaf-cutting ants (LCA) is a conspicuous generalist herbivores of Neotropical forests able to remove an enormous amounts of plant material (including leaves, twigs and bark, flowers, fruits and seed endosperm) to cultivate a symbiotic fungus inside their nests. However, the cost of LCA herbivory and how they might be affecting the plant performance is still poorly known. In this study we investigated whether LCAs affect floral traits and the female fitness: by direct effect (LCA damage the reproductive attributes, compromising the attractiveness and behavior of pollinators) or indirect effect (LCA herbivory constrains the resources available for reproduction). We selected 30 plants located next to LCA nests and we assigned them to one of the following treatments: undamaged plants (n=10), LCA leaf-damaged plants (n=10) LCA leaf- and flower-damaged plants (n=10). The experimental design was in block, which we considered the high of plants as a fixed factor. We quantified the total number of flowers (floral traits), fruit and seed production (female fitness) during the year of 2008 and 2009. LCA only affected the floral traits. Undamaged plants (334.2 ± 157.19) presented an almost two-fold higher flower production as compared to leaf-damaged plants (254.4 ± 146.56) and leaf- and flower-damaged plants (195.3 ± 97.96). Our results indicate that although LCA frequently harvest reproductive structures, reduction on plant reproductive traits results mostly from leaf damage via a reduction in photosynthate availability. This highlights the role played by LCA foliage consumption on plant fitness.

S25.P.11

Influence of extrafloral nectar and seasonality on the structure of ant-plant interaction networks in a neotropical savanna.

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Biotic interactions direct influence the ecological and evolutionary dynamics of species. The analysis of ecological interaction networks is a useful tool to reveal patterns of community organization. Ant-plant interactions often occur in the form of defensive mutualisms, in which ants protect plants against herbivores in exchange for food rewards such as nectar. These relationships have rarely been investigated under a network analysis. Here, we investigate the ant-plant network in a cerrado reserve nearby Uberlândia, MG state, Brazil. Field data were gathered along fifteen 50m-long transects, during two seasons (three times per season, day and night), between October 2010 and January 2011 (rainy season), and April-July 2011 (dry season). Bipartite interaction networks were constructed for both seasons, considering separately plants with and without extrafloral nectaries (EFNs). In order to examine ant and plant assemblages in the search for patterns, the structure and characteristics of networks were compared using metrics commonly used in network analysis. In the rainy season, 712 interactions were recorded involving 38 plant species and 40 ant species, while in the dry season 310 interactions were recorded for 36 plant species and 25 ant species. In general the four observed networks were highly random (not differing significantly from random networks) and presented low nestedness (NODF:18-27) due to generalized interactions between nodes. Specialization was absent and the numbers of modules (4-6) did not differ either between networks or from random networks. Results were the same for plants with and without EFNs in both seasons, indicating that ant-plant interactions occurred independently of EFN presence. EFNs-bearing plants, however, were more visited by ants. Additional investigation taking into account species identities and interaction properties at the species level should help to understand how these ant-plant interactions are shaped in the community. (CNPq, FAPESP, FAEPEX, FAPEMIG).

S25.P.12

Reduction of extrafloral nectary-bearing plants in a severely fragmented Atlantic forest landscape

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Deforestation and forest fragmentation cause non-random extinction which compromise tree traits responsible to maintain biological interactions. However, some non-specialized interactions can be benefited in these new habitats. Extrafloral nectaries (EFN) are specialized nectar-secreting glands evolved independently many times to attract organisms (e.g. ants) that protect plants against their natural enemies. EFN-bearing plants can be established in many types of ecosystems, but they are commonly described as more frequent in open habitats. Here, we investigated if the fragmentation process affects the distribution pattern of EFN-bearing tree species. This study was carried out in a severely fragmented 670-km² forest landscape of the Atlantic forest of north-eastern Brazil. EFNs-bearing trees (DBH ≥ 10 cm) were identified in 48 0.1-ha plots located in three types of habitats: (1) small fragments (n=18), (2) forest edges (n=10) and (3) forest interior (n=20). A total of 18 species were recorded with EFN. Forest edges and small fragments showed a species-poor assemblage and a reduced proportion of EFN-bearing trees. Additionally, the abundance of EFN-bearing trees showed a greater similarity between forest edge and small fragments than forest interior. The species loss was independent of the regeneration strategy and we also found a strong evidence of phylogenetic signal for the presence of EFN in our regional species pool. The reduction of EFN-bearing tree observed in forest edge and small fragments are probably caused by two factors: (1) the physiological intolerance of shade-tolerant EFN-bearing trees and (2) the loss of the protective role played by EFN-visiting ants in pioneer trees. As EFN is a conserved trait vulnerable to the fragmentation process in our study area, the extinction of some plant clades may compromise the interactions among plants, ants, and herbivores, an important force shaping the structure of plant communities.

S25.P.13

Insect herbivores responses to plant characteristics in *Psychotria suterella* Müll. Arg. (Rubiaceae)

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Our objective was to test the following hypotheses: i) Asymmetric leaves suffer higher attack by miner and galling insects ii) Plants with tougher leaves are likely less attacked. In October 2011, we marked 45 individuals of *Psychotria suterella* (CGH ≥ 10cm) in a remnant of montana tropical rain forest in Ibitipoca State Park, Minas Gerais, Brazil. Five branches with 10 cm of length were collected from each individual to estimate the leaves attack by galling and miner insects. Ten leaves per plant of each category (attacked by miner and galling insect morphotypes) were put on white sheet paper containing a scale of 1cm to be scanned. The leaves area were estimated using ImageJ and asymmetry using SigmaScan Pro5. Leaf asymmetry was characterized by the difference between right and left leaf width. Leaves toughness was estimated through the relationship between dry leaves weight/leaves area. Leaves number attacked by miners, abundance of each gall morphotype, each asymmetry category of leaves and leaves toughness were estimated per plant. Miner insects attacked 22,9% of leaves evaluated. One of gall morphotypes attacked stalks and five morphotypes attacked leaves. Only the leaves abundance attacked by miner and abundance of the more abundant (230 occurrences) leaf gall were correlated positively to leaf asymmetry. Galls are able to relocate nutrients of its host plant and may induce asymmetry when are very abundant, while miners may also induce it by eating. Individuals of *P. suterella* presented low leaf toughness as plants species characteristics of humid habitats. Thereby, only the morphotype with more complex architecture, such as large protuberance, decreased their abundance when correlated with higher leaf toughness, what difficult the formation of galls. In conclusion, insects may induce leaf asymmetry in *P. suterella* and even a little toughness in the leaves might interfere with the galls formation and development.

S25.P.14

Herbivory in *Gomidesia palustris* (Myrtaceae) in two formations of restinga, southern Brazil

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Part of the ecological relationships is represented by interaction between herbivores and plants. The availability of light influences in the development of the leaves and in the action of herbivores in the same. Restinga formations differ in stratification and radiation exposure. The objective of this work was to evaluate the response on the leaf hardness, indexes and agents of herbivory in *Gomidesia palustris* (DC.) D. Legrand in two distinct formations of restinga. The study was conducted in shrubby and arboreal restinga in Parque Municipal da Lagoa do Peri, Florianópolis, SC, southern Brazil. At each location, three transects were randomly marked where individuals larger than 1 meter were assessed, totaling 15 plants per area. Six branches of each individual were collected and after defoliation, they had fifteen raffled leaves, totalling 225 leaves per area. These samples were evaluated regarding the index of herbivory (IH), types of herbivory and hardness of foliage with use of penetrometer soon after collection. Although *G. palustris* present greater foliar hardness (191.69 ± 16.57 g; p = 0.0075) in the shrubby restinga, compared to arboreal resting (164.79 ± 28.73 g), characterized by higher incidence of light (55.09%), there was no significant difference in IH between the two areas studied (IH = 1.61 [shrubby] and IH = 1.25 [arboreal]). Damages generated by chewers, cutters and scrapers herbivores were similar in the two areas. The occurrence of leaf miners was greater in the shrubby area (7.12%; p = 0.023) than the arboreal (0.36%). There was no correlation between foliar hardness and IH in the two areas (r = -0.1270, p = 0.6519 [shrubby] and r = -0.1546, p = 0.5821 [arboreal]). These results suggest a response of foliar hardness greater depending on the light intensity without, however, influence in the foliar herbivory that could be regulated by other factors.

S26.OC.01

The myriad consequences of defaunation on trophic cascades: beyond islands and fragments

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Large bodied vertebrates are vanishing in most tropical ecosystems. These vertebrates play an important role as apex predators, herbivores or frugivores and their local extinction will trigger unpredictable consequences in all trophic levels. Most of what we known from the consequences of mammal extinction comes from artificial islands (BCI, Guri Lake) or forest fragments where edge effect and historical events play major roles in structuring the biodiversity. Our research group is studying the effects of local extinctions of large mammals, particularly primates and ungulates, in a 1 million ha continuous Atlantic forest. We systematically carried out censuses of large vertebrates in 12 areas of this continuous forest, totalizing >4,000 km of line transects, thousands hours cameras traps and population estimates from molecular data of elusive mammals. We found large differences in abundance and biomass of mammals that can be attribute mostly to hunting pressure. Through a series of natural and manipulative experiments and intense natural history observations we tested if the functional extinction of large mammals can affect abundance and diversity of small mammals and dung beetles, and the consequences for plant demography and genetic structure. Our results demonstrate that large mammals play a fundamental role as seed dispersal, trampling and herbivory, driving seedling recruitment and changes in functional plant traits along a defaunation gradient.

S26.OC.02

Large-bodied vertebrates stabilize long-term flow of ecosystem services in faunally intact neotropical forests

Peres CA

I investigate continental scale patterns of game vertebrate biomass across a large network of sampling sites surveyed over three decades throughout lowland Amazonia and the Guianan Shields. Macroecological patterns at different spatial scales are examined in terms of the historical and environmental determinants of habitat patch occupancy and species turnover. I first examine the extent to which semi-subsistence hunters deplete large vertebrate populations across Amazonia. Patterns of vertebrate biomass in structurally undisturbed forests are then explained in terms of key environmental variables, including forest type, floristic diversity, forest hydrology, rainfall seasonality, soil fertility and degree of hunting pressure. Regional scale estimates of aggregate vertebrate biomass are highly variable and crucially dependent on the interaction between baseline habitat productivity and levels of offtake. On the basis of a vast network of 2,345 canopy tree plots, I then estimate the consequences of persistent defaunation to forest structure and composition, and ultimately the magnitude of ecosystem services foregone by the chronic depletion of large-bodied frugivores.

S26.OC.03

Community-level effects of vertebrate defaunation on forest composition and regeneration dynamics across a western Amazonian river basin

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The past decade has witnessed a substantial increase in research efforts aimed at documenting and understanding the short- and long-term consequences of defaunation on tropical forest communities. However, large-scale community-level studies have been notably lacking to date. Here, we present recent results from a long-term ontogenetically integrated study of the impact of defaunation on forest composition and regeneration dynamics across the ca. 80,000 km^2 Madre de Dios river basin in the southeastern Peruvian Amazon. We examined the effects of lack of seed dispersal services provided by large frugivorous vertebrates on the spatial distribution and composition of seed fall and sapling recruitment of individual species, as well as at the community level, and tested multiple predictions. We found that seed dispersal rates of vertebrate-dispersed tree species declined by as much as 400% (four-fold decrease) and the spatial distribution of dispersed propagules was truncated by >200% i.e. seeds travelled less than half as far away from fruiting adults in the absence of dispersal mediated by large vertebrate frugivores. Aberrant seed dispersal patterns observed in defaunated sites tended to decrease the diversity of the sapling cohort via increased dominance by some species at the expense of others. An interesting and somewhat unanticipated consequence appears to be the competitive release of certain primate-dispersed species, perhaps as a result of predator satiation, leading to greatly altered spatial patterns of sapling recruitment. We conclude that community-level effects of defaunation are unpredictable and idiosyncratic at the level of individual species and even at the community level. The long-term continuation of community-level, ontogenetically integrated studies conducted at sufficiently large spatial scales will eventually clarify the lasting impact of defaunation on tropical forest communities.

S26.OC.04

Human-induced modifications of the frugivore community translate into reduced seed dispersal at the community level in a Neotropical rainforest

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Tropical rainforests worldwide are coming under increasing pressure from human activities, which are altering key ecosystem processes such as plant-animal interactions. However, while the direct impact of human disturbance on communities such as game species has been well studied, the consequences of impoverished animal communities on mutualistic interactions such as seed dispersal remains chiefly understood at the plant species level. We asked whether communities of endozoochorous tree species had altered seed dispersal in forests affected by hunting and logging and if this could be related to modifications of the frugivore community. We focused on four families of animal-dispersed trees (Sapotaceae, Myristicaceae, Burseraceae and Fabaceae) at two forest sites in French Guiana. The human-impacted site, Montagne de Kaw, is located close to urban areas and sees both hunting and logging, while the remote control site, Nouragues Research Station, is virtually untouched. On both sites, we estimated seed dispersal rates from fruit and seed counts conducted in one square meter quadrats placed under fruiting trees, while the diversity and abundance of the frugivore community was evaluated during daytime censuses conducted along line transects. Overall seed dispersal rates were significantly reduced in Kaw. This was also true at the family level, with significantly lower seed dispersal rates found for Burseraceae, and Myristicaceae and Sapotaceae even more so. This was correlated with major modifications in the frugivore community, with several key dispersers such as large-bodied primates greatly reduced in abundance in Kaw, where the specialist frugivore *Ateles paniscus* is nearly extinct. Our results highlight to what extent human disturbance indirectly impacts seed dispersal at the community level through modifications of the frugivore community.

S26.OC.05

Ecological erosion of an Afrotropical forest and potential consequences for tree recruitment and forest biomass

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Unprecedented rates of logging and hunting in Central Africa threaten to transform vast tracts of primary forest into a mosaic of degraded forest, emptied of wildlife. Reductions in the abundance of animals that play functional roles are known to alter forest structure and diversity. We test the Forest Herbivore Hypothesis (FHH) that post-harvest hunting decreases abundance of meso- and mega-herbivores and releases fast-growing tree species from herbivory. This human-animal mediated trend leads to a lower proportion of slow-growing, high wood density tree species, diminishing the long-term potential for forests to store carbon.

To test the FHH we established 30 sites along a gradient of logging and hunting intensity in the Republic of Congo. We randomly located 10 sites within three forest types: logged/hunted forest, logged/unhunted forest, and unlogged/unhunted forest. Each site included a 2.5 km transect for quantifying animal densities and a 1-ha tree plot for measuring forest diversity and structure. Within each site we employed 21-1m^2 traps (N=630 traps) to quantify seed rain; and we conducted caged and uncaged seed addition experiments for six species to evaluate seedling recruitment.

Compared to logged/unhunted forest, logged/hunted forest had lower densities of meso-herbivores, including duiker (-50%) and forest pig (-31%), and higher densities of squirrels (+75%). As a result, seed predation was 188% higher and herbivory was 172% lower in hunted forest. Low rates of herbivory in hunted forest resulted in high rates of seedling recruitment and survival of fast-growing species that allocate few resources towards anti-herbivore defenses. Correspondingly, tree plots in logged/hunted forest had 16% less biomass than logged/unhunted forest and a higher diversity and number of fast-growing species.

Several lines of evidence support the FHH, suggesting that ecosystem services are linked to the functional roles of animals, and the loss of herbivores may engender changes in diversity and carbon storage.

S26.OC.06

Ecological consequences of the rapid loss of Asian megafauna — Neotropicalization in the 21st century?

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Southeast Asian mammal megafauna — here loosely defined as mammals with a body mass larger than 44 kg — escaped the widespread Quaternary Megafaunal Extinction event and is still represented by a long list of species, including elephants, rhinoceros, wild cattle, orang utans, large cats, and others. However, human pressure in the form of hunting, land use change, and direct competition for food and resources has resulted in a drastic reduction of the geographical range of most of these megafauna species, leaving large extensions of natural habitat defaunated. This process has been exceptionally fast in the last couple of centuries, which results in large-scale changes in a very short period of time. In order to evaluate the ecological consequences of this rapid 'Neotropicalization' of SE Asian ecosystems, here I review the available information on range reduction of these species in the last *c.a.* 1000 years and discuss implications for ecological processes such as the maintenance of sub-climax vegetation and habitat heterogeneity, seed dispersal, nutrient cycling, and ecosystem engineering thought the creation of wallows and trails. Finally, I stress the importance of comparative studies on ecological function in forest with different levels of defaunation and discuss possible refaunation measures in SE Asian tropical ecosystems.

S26.OC.07

The equalizing effect of frugivory and seed dispersal networks

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A fundamental goal of ecology is to understand the mechanisms that form and maintain diverse communities. It is clear that a big fraction of diversity is composed of uncommon and rare species – especially in hyper-diverse tropical forests. The *why* and *how* of this pattern has puzzled several generations of ecologists. Because tropical forests are overwhelmingly dominated by trees dispersed by fruit-eating animals (a.k.a. frugivores), it is believed that this mutualistic animal-plant interaction is key for the organization, structuring, and maintenance of diversity in tropical forests. Still, direct evidence of how frugivores contribute to the community-wide maintenance and propagation of diversity patterns has been difficult to demonstrate. Here I show how frugivores can help maintain rare plant species in tropical forests and describe a novel mechanism that I baptize "*the equalizing effect of frugivory and seed dispersal*" (EFSD). I demonstrate this mechanism by studying the community-wide production of fruits in a secondary forest in Puerto Rico, and the bird-generated seed rain and resulting plant recruitment patterns in experimental plots. My results show that many rare species are overrepresented in the avian seed dispersal network, and that common species are not as abundant as they should be. The resulting recruitment patterns also show an overrepresentation of rare species. My study demonstrate that frugivores "equalize" (*sensu* Chesson 2000) by 2-7 orders of magnitude the relative abundance of plant species during seed dispersal and recruitment stages. I propose that this mechanism can clearly favor the coexistence of plant species despite large differences in their relative abundance, fecundity, and competitive ability.

S26.OC.08

Ricocheting trophic and non-trophic cascade limits lianas and understory insectivorous birds in Central America

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Although most research on altered mammal communities in fragmented tropical forests focuses on defaunation, apex predator loss can contribute to increased abundance of large primary consumers. Abundant large primary consumers can in turn have top-down effects that ricochet to affect other animals, e.g., birds, via altered bottom-up effects, and may do so by both trophic and non-trophic pathways. Tropical rainforest understory insectivorous birds are highly fragmentation-sensitive, but have nearly disappeared from larger fragments, e.g., 1600ha La Selva Biological Station, Costa Rica, while persisting at smaller nearby fragments, e.g., 345ha Reserva Tirimbina. Collared peccaries (*Pecari tajacu*) have increased at La Selva from ~0 in 1970 to >14/km^2 today, concurrent with understory insectivorous bird declines. Our research supports a three-part hypothesis: (1) *P. tajacu* are reducing liana tangle frequency, (2) Several understory insectivores forage selectively in liana tangles, and (3) Declines in this guild correspond with liana tangle loss. Research was conducted at six sites in Nicaragua, Costa Rica, and Panama with *P. tajacu* densities of 3 - >14/km^2. Our results indicate that collared peccaries reduced vine and liana density, cover, and liana tangle frequency relative to experimental mammal exclosures. The avian focal species (*Terenotriccus erythrurus*, *Epinecrophylla fulviventris*, and *Microrhopias quixensis*), all selected foraging sites with high liana density, cover, and tangle frequency. Avian declines are associated with high peccary densities and few liana tangles. This is the first study to our knowledge to show that understory insectivorous birds are vulnerable to foraging microhabitat loss. Our research highlights the important role of indirect effects in rendering even large forest tracts unsuitable for remnant species, and suggests that reserve creation alone is insufficient to preserve some species. Our study also provides valuable information on how birds respond to changes in understory vegetation, and highlights the beneficial role of lianas as avian foraging habitat.

S26.OC.09

Thieving rodents as substitute dispersers of megafaunal seeds

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The Neotropics have many plant species that appear to be adapted for seed dispersal by megafauna that went extinct in the late Pleistocene. Given the crucial importance of seed dispersal for plant persistence, it remains a mystery how these plants have survived more than 10,000 years without their mutualist dispersers. Here, we present support for the hypothesis that secondary seed dispersal by scatter-hoarding rodents has facilitated the persistence of these large-seeded species. We used miniature radio transmitters to track the dispersal of megafaunal seeds by Central American agoutis, which scatter-hoard seeds in shallow caches throughout the forest. We found that seeds were initially cached in the soil at short distances and then quickly dug up again. However, rather than eating the recovered seeds, agoutis continued to move and re-cache the seeds, up to 36 times. Agoutis dispersed an estimated 35% of seeds for >100 m. An estimated 14% of the cached seeds survived to the next year, when a new fruit crop became available to the rodents. Serial video-monitoring of cached seeds revealed that the stepwise dispersal was caused by agoutis repeatedly stealing and re-caching each other's buried seeds. While previous studies suggest that rodents are poor dispersers, we demonstrate that communities of rodents can in fact provide highly effective long-distance seed dispersal. Our findings suggest that thieving scatter-hoarding rodents may substitute for extinct megafaunal seed dispersers of large-seeded trees.

S26.OC.10

Cascading effects of defaunation on the recruitment dynamics of a large seeded tree in the Atlantic rainforest

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Combining with a high deforestation rate, poaching in the rainforests threatens most plant and animal populations. Poaching targets mostly large and medium mammal herbivores, seed dispersers or seed predators. The local extinction of this fauna may alter important plant-animal interactions, yet few studies have measured this impact along a defaunation gradient. Therefore, cascading effects on the demographic and genetic structure of plant populations are expected, especially for large-seeded species needing large seed dispersers. This study aimed at determining the cascading effects of defaunation on plant-animal interactions, focusing on local extinctions of large primates. We determined the effect of defaunation on the recruitment dynamics of a large-seeded species, *Cryptocarya mandioccana* (Lauraceae), along a defaunation gradient in the Atlantic Forest, Brazil. Specifically, we intend to determine the qualitative and quantitative contribution of each seed disperser to the recruitment dynamics of *C. mandioccana* through the combination of behavioral data (home range use and feeding), field experiments (seed predation, germination and seedling survival) and genetic analyses (seed dispersal distances). Our preliminary data have shown a decreasing seed dispersal by arboreal frugivores and a decreasing percentage of removal of dispersed seeds by terrestrial frugivores along the defaunation gradient. The main seed dispersers were the muriqui, *Brachyteles arachnoides*, in the less defaunated site and the jacutingas (*Aburria jacutinga*) in the semi and highly defaunated sites. Rodents were the main seed predators in all sites. At this stage, our study could highlight a clear positive dispersal effect on seed germination in all areas and a negative defaunation effect on seed predation, increasing seed survival along the defaunation gradient.

S26.OC.11

Can defaunation affect plant diversity in the Atlantic Forest?

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Large mammals have a key role in the survival and distribution of plant species, acting as stewards of forest diversity. However, their role is severely disrupted when there are low densities of large mammals, causing disruption in the interactions between them and the plants. This study evaluated whether the absence of large mammals results in loss of seedling diversity by looking at differences in recruitment and composition of seedlings between exclusion and control plots. We studied at a defaunated (absence of tapir and peccary) and at a non-defaunated (presence of tapir and peccary) site, both located at Serra do Mar State Park. At each site, we built 15 pairs of plots (3 x 5 m), half fenced with a 1.5-m-high screen (exclusion plot) and the other half opened (control plot). We subdivided each plot into quadrants (1 m^2). In three of the subplots, we conducted seedling-survival experiments. We marked saplings between 10 cm and 1 m, identified and followed every six months, for 12 months. We used multivariate dispersion – based on Jaccard and Bray-Curtis indexes – to compare beta diversity between treatments. There was no significant difference between treatments for either sites (control: $p = 0.40$ Jaccard and Bray-Curtis $p = 0.19$; defaunated: $p = 0.61$ Jaccard and Bray-Curtis $p = 0.87$). We believe that 12 months were not sufficient to show the expected significant differences in seedling diversity between exclusion and control plots at the non-defaunated site and that a longer exclusion time will lead to our expected results.

S26.OC.12

Beetles as physical and biochemical ecosystem engineers: ecological and molecular evidence of trophic upgrading in a tropical arthropod community

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Ecosystem engineering controls the availability of resources used by other organisms, influencing community structure and biodiversity. Insect herbivores may act as ecosystem engineers but there is still poor understanding of insect ecosystem engineering, particularly for stem-boring insects. We evaluated the effect of ecosystem engineering by the stem-borer *Oncideres albomarginata* on the arthropod community of a tropical dry forest for three consecutive years, to determine if the modification of tree branches by *O. albomarginata* promotes interactions with positive effects on arthropod diversity. We simulated *O. albomarginata* physical modification of *Spondias purpurea* branches, and compared community attributes between non-engineered and engineered branches. We also studied the genes and digestive enzymes (cellulases) of *O. albomarginata* involved in wood degradation. The results showed that *O. albomarginata* engineering had strong positive effects on the species richness and composition of the associated arthropod community. These effects cascade upward to higher trophic levels, and were mainly related to the creation of a habitat with high availability of oviposition sites for secondary colonizers, and to the increase of the availability of digestible food through the *O. albomarginata* metabolic ability for degrading wood into simple sugars. *O. albomarginata* has three genes encoding cellulases which showed a total enzymatic activity of 16 U/mg protein, two orders of magnitude higher than the activity of other secondary colonizers. Overall, ecosystem engineering by *O. albomarginata* was responsible for 95% of the abundance of secondary colonizers and 82% of the species richness. Our results suggest that ecosystem engineering by *O. albomarginata* is a keystone process structuring an arthropod community composed of three trophic levels. This study also suggests that the ability to degrade plant polymers such as cellulose plays an important role in the evolution of stem-borer communities, and probably in the diversification of insects

S26.P.01

Top-down effects of insects and fungi on tropical forest seedling diversity and composition

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Evidence is accumulating that the structure and diversity of tropical forest plant communities can be profoundly influenced by density-dependent and distance-dependent interactions with their natural enemies, such as pathogens and herbivores. I will describe experimental work in tropical forest in Belize, Central America, aimed at identifying the natural enemies responsible for density dependence and investigating the causal link between natural enemies and plant diversity. Focusing on the seed-to-seedling transition, we found that density-dependence was widespread, and that excluding insect seed predators and herbivores using systemic insecticides greatly increased overall seedling survival, disproportionately benefiting a set of abundant, small-seeded species. In contrast, fungicide treatment had no net effect on seedling survival but led to a small but significant decrease in seedling diversity. Our results suggest a key role for insects in structuring the composition of tropical forest plant communities, and a possible role for fungal pathogens in maintaining their diversity.

S26.P.02

Does the strength of trophic cascades vary with ecosystem size? Tests using natural microcosms

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Habitat structure (HS) can vary substantially in space and time affecting the strength of predator prey interactions. For example, larger habitats often present higher microhabitat heterogeneity than small ones, which affects predation rates by providing absolute or stochastic refuges to prey. Such habitat-mediated predation effects can cascade through multiple trophic levels, affecting ecosystem functions carried out by lower trophic levels. Here, we tested whether HS mediates the cross ecosystem effects of terrestrial predators on aquatic arthropod abundance and ecosystem functioning (detrital processing). We manipulated the presence of terrestrial bromeliad-living predators (spider *Aglaoctenus castaneus*, Lycosidae) in bromeliads of different sizes (small: 100–200 ml; large: 800–900 ml) using a factorial design in blocks, over three months. We predicted that the strength of top-down effects on prey abundance and detritus loss could be higher in smaller habitats; the success of prey capture should be higher in small bromeliads where spiders can access much of the available microhabitats of insects, possibly reducing abundance of detritivores (i.e., the most common colonizers) and consequently decomposition. Large bromeliads had three times more arthropods than small ones. The terrestrial predators decreased the abundance of predatory damselfly larvae (Zygoptera) only in small bromeliads, but did not affect the abundance of other predatory and detritivorous arthropods in larger bromeliads. Detritus decomposition rate was stronger in small bromeliads, and the strength of this effect was even higher in the presence of spiders (and low abundance of damselflies). It is likely that within small bromeliads spiders can indirectly facilitate decomposition by (i) directly decreasing aquatic predator abundance and (ii) indirectly increasing the foraging activity of detritivores in the food web under low predator density. We showed that HS can mediate the cross ecosystem effects of terrestrial predators on aquatic arthropods and detrital processing.

S26.P.03

Ecological determinants of extinction risk: local abundance, niche breadth and dispersal ability as correlates of small mammal responses to forest fragmentation

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Anthropogenic disturbances, particularly habitat loss and fragmentation, are considered the main causes of the increase in extinction rates observed in the last decades. Given that extinction risk varies widely among species, the underlying mechanisms have been in the center of ecological debates. Here, we investigated the effects of three ecological traits - niche breadth and local abundance both associated with rarity, and dispersal ability - on the risk of local extinction in Atlantic forest small mammals due to habitat fragmentation. We used a large dataset on species occurrence across three fragmented landscapes with 50%, 30% and 10% remaining forest (50 fragments and 36 sites in agriculture) and three adjacent continuously-forested landscapes (18 sites) to calculate: an index of vulnerability to forest fragmentation, and an index of niche breadth in terms of habitat specialization. From a two-year capture-recapture dataset in three 2-ha grids in continuous forest, we estimate species abundance and an index of dispersal ability related to the maximum distance moved by individuals. Using a model selection approach, we then evaluate which of the existing hypotheses on the relationship of local abundance, dispersal ability and niche breadth with extinction risk is most plausible. Results highlight niche breadth as the main determinant of the risk of local extinction due to fragmentation. Local abundance was secondarily important, with a positive effect on extinction risk, which is stronger among species with narrower niche breadth. This result is consistent with the idea of a tradeoff between competitive ability, promoting high local abundance, and colonization ability, which would lead to a lower extinction risk in less abundant, competitively inferior species. Because dispersal ability varied little among studied species, and colonization ability is also determined by population growth rate, risk of extinction among forest specialist small mammals might be determined by population growth rate.

S26.P.04

Defaunation and trophic cascades on dung beetles in the Atlantic Forest

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Many studies have assessed the direct effects of vertebrate hunting on ecosystem processes, yet we lack knowledge about the possible indirect effects of defaunation. Dung beetles are clearly dependent on large mammals for adult and larval food resources and provide numerous services for the ecosystem such as soil aeration and fertilization as well as secondary seed dispersal. Since large mammals are the main targets of hunters, their decline can indirectly affect dung beetle communities and secondary seed dispersal. Here we investigated the impacts of defaunation on dung beetle assemblages at eight sites in a defaunation gradient in the Brazilian Atlantic Forest. We collected dung beetles using 20 pitfall traps baited with human faeces and exposed during 48 hours, in each site during the rainy season. We predicted: (1) an altered community composition and (2) a lower abundance of dung beetles in heavy defaunated sites, (3) a lower abundance of large species and (4) a higher abundance of small species in heavy defaunated sites, (5) the absence of specialist/preferencialist dung beetle species associated to the dung of the hunted mammal species, and (6) the predominance generalist species in heavy defaunated sites. A total of 4075 dung beetles were collected. Unexpectedly, we found higher abundances of dung beetles in the defaunated sites. Our future analysis of species diversity should help us to explain this result. This is the first study aiming to assess dung beetle responses to changing of mammal communities in the Atlantic Forest.

S27.OC.01

Ecology of avian pox and malaria in the Hawaiian Islands: an ongoing conservation crisis

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The introduction of avian pox virus (*Avipoxvirus* spp.), malaria (*Plasmodium relictum*), and a competent mosquito vector (*Culex quinquefasciatus*) to the Hawaiian Islands is an iconic example of how new host parasite introductions can have devastating consequences on naïve wildlife populations. Of more than 50 species of endemic Hawaiian honeycreepers known historically from the islands, fewer than 20 still persist, with most limited to narrow bands of high elevation forest. While a variety of interacting limiting factors are responsible for these declines and extinctions, high susceptibility to malaria and pox is one of the primary factors responsible for their demise. Most remaining species have survived into this century because transmission rates for these pathogens decline dramatically above 1500 m, where temperature limits both mosquito numbers and extrinsic development of malarial parasites within their mosquito vector. Long term stability of these refugia is increasingly threatened by global climate change. A combination of rising temperatures and declining rainfall may have contributed to increasing prevalence of malaria and retreat of several highly endangered honeycreepers over the past decade to the upper limits of available habitat on the island of Kauai. By contrast, high transmission rates and intense selection pressure at lower elevations have led to the recent emergence of tolerance to malaria in Hawaii Amakihi (*Hemignathus virens*) and this relatively common native species appears to be rebounding in some low elevation habitats on the island of Hawaii. The complex interactions among pathogens, population dynamics of a single vector, a broad range of endemic and introduced avian hosts, and elevational gradients of temperature and rainfall make this an exceptional system for investigating the drivers of malaria transmission and the evolutionary dynamics of new host-parasite interactions.

S27.OC.02

Risks and consequences of the spread of avian malaria between the tropics and the temperate regions

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Emerging infectious diseases (EID) are a growing threat to biodiversity, livestock and human health. Because most of the vast number of parasites are specialists, the distribution range of parasites are ultimately restricted by the ranges of their host species and vectors. At present, species ranges are changing at unprecedented rates as a result of habitat alterations, accidental introduction of invasive species and global warming. Hence, with the range changes of the hosts and vectors follow the range changes of their parasites. This is setting the scene for a large number of novel and evolutionary untested host-parasite-vector interactions. Such first-time interactions may involve cases in which the parasite is already adapted to invade the new host, whereas the new host population lacks protective immunity. Perturbations of species ranges are therefore likely to result in opportunities for parasites to switch into naive hosts without any adaptive change, a process recognized as ecological fitting (EF). Such switches are the starting point of EIDs. Avian malaria and haemosporidian parasites provide an excellent model system to study EF and EID. I will use the database “MalAvi” providing information on host and geographic distribution for more than 1000 parasite lineages in more than 650 species of birds to examine 1) patterns of differences between malaria parasites of resident bird communities in the tropics and temperate regions and 2) how these communities of parasites are connected by intercontinental migratory birds. I will discuss these results in the context of fitness costs of malaria parasites estimated from recent experimental infection studies.

S27.OC.03

Galapagos birds and their blood parasites

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In collaboration with scientists at the University of Missouri ? St. Louis, the Saint Louis Zoo, the Galapagos National Park, and the Charles Darwin Foundation, we have screened more than 3000 birds from the Galapagos Islands for the presence of Haemosporidian blood parasites. We have found new species in the genus Haemoproteus, vectored by Hippoboscid louse-flies, as well as four lineages in the genus Plasmodium. Only one lineage of Plasmodium appears to be established on the islands, undergoing regular transmission across years and islands. This lineage infects Galapagos penguins *Spheniscus mendiculus*, yellow warblers *Dendroica petechia*, and two species of Galapagos finches *Geospiza* spp but with no evidence of development to erythrocytic stages. We are exploring the introduced cattle egret (*Bubulcus ibis*) and smooth-billed ani (*Crotophaga ani*) as reservoirs, and the recently introduced *Culex quinquefasciatus* mosquito as vector, with an eye to opportunities for eradication of the parasite prior to adaptation of one of the endemic host species as competent hosts. Further, we are exploring the potential role of the Bobolink *Dolichonyx oryzivorus*, the only migratory passerine bird passing regularly through Galapagos in its annual migration from North America to Argentina, in ongoing introductions of parasites to the islands. In approximately 240 bobolinks tested from their North American breeding grounds, we have found matches for two of the Plasmodium lineages recovered in Galapagos.

S27.OC.04

Fine scale habitat elements impact the prevalence and diversity of avian haemosporidian parasites in tropical ecosystems.

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Human domination of the planet has rapidly led to increases in the relative fractions of deforested and agricultural land on the Earth's surface. Debate over balancing agricultural production and biodiversity conservation has generated two opposing strategies: a "land sparing" approach involving large-scale nature reserves, versus a "land sharing" approach where agricultural areas support wildlife through fine-scale conservation. This debate however has largely ignored the effects of the different strategies on disease dynamics. Here we give a cross-continental perspective on how land use changes, especially deforestation and agricultural use can affect the prevalence and lineage diversity of avian blood parasites. Work from Sub-Saharan Africa demonstrates that anthropogenic habitat change can affect host-parasite systems and result in opposing trends in prevalence of haemosporidian parasites in wild bird populations. With further work in Costa Rica, we quantify how avian malaria in an abundant sedentary bird species responds to landscape features at fine scales (≤ 4 m^2). Resulting data revealed no significant differences in habitat usage or home range size associated with infection status. However, we find the proportion of countryside forest elements within a radius of 150 m, and proximity to the nearest river to explain 84% of the variance in malaria prevalence. We simulated "land sparing" and "land sharing" landscapes and modeled malaria prevalence to find that land sharing mitigates malaria prevalence more effectively at all agricultural scales. We emphasize that influences of land use changes on parasite prevalence are complex, and will require the detailed study of the vector ecology, and the further quantification of fine-scale habitat effects.

S27.OC.05

Prevalence and diversity of avian haemosporidian parasites in different biomes in Brazil.

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In recent years, avian malaria parasites have been received special attention due their potencial negative effects on physiology and fitness of their hosts and to constitute a suitable model to studies concerning the parasite-host-environment relationships. Brazil is tropical country with continental extent exhibiting a remarkable diversity of ecosystems which harbors one of the most diverse avifaunas in world. The peculiar aspects of these environments has influence on the structure of avian communities and could also influence avian malaria communities. In this context, we sampled 2879 birds from 19 localities across the major Brazilian biomes - Amazonian and Atlantic Rain Forests, Tropical Dry Forest, Neotropical Savanna and Pantanal - in order to (1) describe the lineage diversity of *Plasmodium* and *Haemoproteus* as well as to infer their phylogenetic relationships; (2) propose phylogeographic patterns of the lineages; and (3) test if differences on prevalence, lineage richness and composition can be explained by factors related to environment (biome, season, geographic barriers), avian host (composition, richness, abundance, habitat preference) and conservation degree. Our preliminary results have revealed considerable global prevalence (36%), although the prevalence varied among the sampled sites which ranged from 15.1% to 54.3%. The most of the lineages belongs to *Plasmodium* genera (84%), being 89 identified as *Plasmodium* and 22 as *Haemoproteus* lineages. The GLM analyses revealed that the differences on prevalence and lineage richness could not explained by the biome, season or conservation degree. However, the differences on lineage richness could be explained by the avian host richness and abundance as well by the habitat preference. Similarly, the differences on lineage composition varied according to avian species composition. Our preliminary findings depict the importance of the Brazilian biomes as huge storehouse of hemosporidian lineages and the impact of the avian local community on the structure of the parasite community.

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S27.OC.06

Organization of a tropical and a temperate assemblage of avian malaria parasites

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Many wildlife pathogens, including avian malaria parasites, are capable of infecting multiple host species. Thus, the local assemblage of potential hosts is relevant focus for understanding the distributions of individual parasite populations. When community studies of avian malaria parasites were first undertaken, a notably lower prevalence (proportion infected hosts) was reported in the tropics compared to temperate regions. We were interested in exploring other differences within local parasite assemblages. Using molecular techniques, we compared prevalence and organization of malaria parasites in assemblages of forest birds: one in the western Amazon and one in the North American Ozarks.

We estimated prevalence, a two-dimensional index of entropy (network-wide specialization), niche overlap (from both the parasite and host perspectives), and species-specific specialization using network analysis. Additionally, we calculated Rao's quadratic entropy index to incorporate phylogeny for species-specific specialization.

Among our findings was reduced assemblage-wide prevalence in the tropics, consistent with the dilution effect hypothesis of pathogens in hyperdiverse host communities. Network-wide specialization, niche overlap, and specialization of individual parasite lineages occurring in both regions were similar in both sites, suggesting that some properties of avian malaria assemblages are insensitive to host diversity and latitude. Compared to null models, both sites exhibited greater network-wide specialization and lower niche overlap from the parasite perspective than would be expected by chance based on the basic structure of the assemblages (i.e., number of interacting species and connectivity). However, prevalence among hosts was more variable and the average host specificity tended to be higher in the tropical site.

In sum, based on the results from two local sites at disparate latitudes, a tropical and a temperate assemblage of avian malaria parasites exhibited similar organization, despite the lower prevalence, higher host diversity, higher host specialization, and milder climate of the tropical forest location.

S27.P.01

Host-specificity analyses of avian malaria parasites in bird communities from Southeast Brazil

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Host-specificity is an underlying feature of the host-parasite relationships which affects the ability to reach new habitats and hosts. Recently, several index have been proposed in attempt to better estimate this feature, including parameters related to the differences on prevalence observed in each host (structural specificity), phylogenetic relationships among the hosts (phylospecificity) and the dissimilarities of hosts across the local communities (β-specificity). In this context, our primary goal is to estimate the host specificity of avian malaria lineages infecting a sample of birds from Southeast Brazil (55 species, 10 sites) and test if the different measures of host specificity are associated to ecological and evolutionary factors. A total of 856 bird samples were screened and 351 *Plasmodium/Haemoproteus* infections were identified, and positive samples were sequenced in order to identify the cyt-b mitochondrial lineages of the parasites. For host-specificity analysis, we considered only lineages with more than five records and occurring in more than 3 sites (18 lineages). Our preliminary results revealed that the β-specificity (BSPF) varied remarkably among the lineages, ranging from lineages that were found at same host in all sites (BSPF = 0) to lineages that were observed in distinct hosts in each site (BSPF = 1). However, as the β-specificity could be affected by the species turnover in local host communities, we also tested if the lineage is associated to the host β-diversity (a estimator of species composition dissimilarities among local communities) by a regression analyses which show a positive association ($r=0.25$, $p=0.019$). The evaluation of the residual deviation values (that indicates how the values is affected by host community turnover) revealed opposite trends for some lineages, demonstrating the importance of considering host turnover on β-specificity estimates. Next steps include measuring of the other host specificity index and correlate them with ecological and evolutionary factors.

S27.P.02

Testing hypothesis of host exploration strategies using data on distribution of avian Plasmodium lineages in bird communities from Southeast Brazil

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A crucial issue in understanding the host-parasite systems is to identify what factors determine the success of colonization of new areas by the parasites. One underlying factor is the parasite's ability to infect and transmit among hosts. Two alternative hypotheses have been invocated to explain how the host exploration strategies could be related to the success of colonization in host communities. The Trade-off hypothesis states that generalist parasites that infect distantly related hosts are less able to adapt to all their host species and show lower prevalence. However, the Resource breadth hypothesis postulates that parasites with a broader host range have a greater possibility of encountering suitable hosts that increase the transmission success and the prevalence. Here, we used data on distribution of *Plasmodium* cyt-b lineages in 20 birds species, sampled in bird communities from Southeast Brazil, to test if the relative frequency of the lineages in their hosts are associated to the lineage host range. We include in our regression analyses only lineages with more than five records (26 lineages, 175 records), as an attempt to minimize sampling of rare lineages which could introduce sampling bias. The regression analyses revealed a negative association between the relative frequency of lineages in each host and their host range ($r = 0.173$, $p = 0.001$), indicating that lineages able to infect more lineages (generalist lineages) presented lower relative frequencies in their hosts than those lineages that present a more limited host range (specialist lineages). Moreover, considering the overall relative frequencies (for all 20 species sampled), we observed that the frequency of specialist lineages is higher than the generalists, indicating that the specialist strategy appears to be more efficient although this strategy should be substantially dependent of the presence of suitable hosts, and possibly limit the lineage ability to reach new geographical areas.

S27.P.03

Colonization history and origin of the Galápagos flycatcher (*Myiarchus magnirostris*; Passeriformes: Tyrannidae) and its parasites

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Myiarchus magnirostris (MAG) is an endemic species to the Galápagos Islands, Ecuador, and is among the least studied Galápagos terrestrial birds. We were interested in unveiling the origin and colonization history of MAG, and also the origin of the parasites that are currently found on MAG. To determine MAG's origin, we rebuilt the *Myiarchus* phylogeny using cytb and ND2, and applied a Bayesian approach to estimate its colonization time. We discovered that the closest living relative of MAG is *M. tyrannulus* from Central and North America, and these two sister groups diverged approximately 850,000 years ago. To study the origin of MAG's parasites, we collected blood samples, lice, and mites from MAG (n=254) and from *M. tyrannulus* (n=74) in Costa Rica. We found that different parasite species from MAG have different origins: five species came to the Galápagos with MAG's ancestors (two louse species and three mite species), and two species were acquired from the native bird community after MAG's ancestors arrived to Galápagos (*Haemoproteus* blood parasite and *Brueelia* louse). Finally, to better understand the evolution of MAG, we used seven microsatellites and morphological characters to compare populations from seven islands. Correlation between genetic diversity and island size pointed to drift as an important diversification force. We also detected population genetic structure (Fst=0.0945; p=0.000), but no correlation between genetic and geographic distances. Morphological distances between islands were not correlated to genetic distances. Morphological differentiation was observed even in the presence of gene flow, possibly due to local adaptation, but lower migration rates together with drift could also be contributing to differentiation of populations from other islands. This study reveals that during the last 850,000 years (1) the Galápagos bird parasite community structure changed, and (2) MAG experienced further species-level morphological and genetic differentiation within the archipelago.

S28.OC.02

Woody vegetation change in all ecoregions and protected areas of Latin America and the Caribbean, 2001-2010.

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Conservation science uses biomes and finer-scale ecoregions for assessing the extent of species, habitat and ecosystem services, monitoring and predicting change, and establishing global priorities. To assist conservation efforts, we analyzed woody vegetation (trees, shrubs) change from 2001 to 2010 for all ecoregions (excluding mangroves) and their protected areas (PAs: IUCN categories, indigenous reserves) within Latin America and the Caribbean (LAC). Change in woody vegetation was based on linear models of annual area vs. time (10 years), with three models per ecoregion: 1) entire ecoregion, 2) outside of PAs, and 3) inside of PAs. Of 169 ecoregions, 13% and 43% had significant ($p \leq 0.05$) gains and losses of woody vegetation, respectively. Our data indicate that PAs in LAC are effective at preventing deforestation and facilitating woody recovery. Percent change was significantly more negative outside of ecoregion PAs than inside ($p=0.02$); in addition, 85% of ecoregions had no change in protected woody vegetation, while 7% had significant gains.

In the tropical/subtropical moist broadleaf forests (TSMBF) biome, 42% of ecoregions had significant deforestation (55% of total), representing a 3% net loss of high biodiversity forests (175,764 km^2); however, we estimated that 42% of remaining TSMBF area is now in some form of protection, and deforestation in these PAs was minimal. Tropical/subtropical dry broadleaf forests (TSDBF) had a net 11% (108,139 km^2) deforestation, and 13% of remaining TSDBF is in protected areas. PAs in TSDBF had mixed effectiveness, as 10% of ecoregions had significant deforestation inside of PAs, relative to 23% with deforestation outside of PAs; however, there was also significant forest recovery inside and outside of PAs (13% and 26% of ecoregions, respectively). The deserts and xeric shrublands (DXS) biome had a total 136,853 km^2 gain of woody vegetation (e.g., woody encroachment), with 32% of ecoregions showing significant gains, mostly outside of PAs.

S28.OC.03

Agricultural Expansion Can Menace Brazilian Protected Areas During the 21st Century

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The main current threat to biodiversity is habitat destruction, which is motivated mostly by agricultural expansion. This threat is especially important in Brazil, a megadiverse country devoted to agribusiness. Here, we addressed the following hypotheses: (i) protected areas are less covered by agriculture than areas not protected to date; (ii) this pattern will hold throughout this century; (iii) these effects differ between categories of protected areas. We overlaid an agricultural expansion model for the 21st century (IMAGE) and the Brazilian protected areas to calculate the conflict between these two land uses. Agricultural extent represents 22% of Brazilian area in current time but should increase up to 40% by 2100. Although the absolute values are relatively smaller, the increase of agricultural extent will be much higher in protected areas (11% to 30%). Consequently, strategic actions are needed to reduce the damages of this agricultural expansion to biodiversity.

S28.OC.04

Are parks succeeding? State of 101 protected areas in Latin America.

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An expanding global population and economy mean that parks everywhere are exposed to forces of change. Some types of change are legal and benign, such as the development of tourist infrastructure and training of personnel, whereas others are illegal and malignant, such as poaching, land appropriation, habitat destruction and many others. ParksWatch was founded to evaluate the status of national parks and other high-level protected areas (PAs) and to establish baseline information for future evaluations. ParksWatch operated as a partnership between the Center for Tropical Conservation in Duke University, USA, and collaborating entities in 7 Latin American countries (Mexico, Guatemala, Venezuela, Peru, Bolivia, Brazil and Argentina). Systematic on-site evaluations were completed for 101 PAs. Each evaluation is summarized in a "Park Profile" available at www.ParksWatch.org. Here we present an analysis of these evaluations. We quantified threats using an index that combined the severity of a threat with the extent of its occurrence in a given PA. Socioeconomic and management indicators were also included in the general linear model employed in the analysis. Poaching, agriculture, grazing and logging proved to be the most pervasive threats. Failure to implement management plans, insufficient numbers of park guards and inadequate infrastructure were the management indicators most highly associated with elevated threat scores, followed by country, local population density and IUCN category.

S28.OC.05

Conservation performance of strictly-protected and sustainable-use tropical reserves under varying human population density and economic prosperity

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Protected areas form a quintessential component of the global strategy to perpetuate tropical biodiversity within relatively undisturbed wildlands, which are becoming increasingly isolated by rapid agricultural encroachment. Here, we consider multiple biophysical datasets describing virtually the entire network of ~1,500 protected areas *sensu stricto* (PAs) in the world's largest tropical country (Brazil) to examine the degree to which they remain intact, and the main determinants of aboveground habitat loss under varying contexts of rural development. PAs within the complex Brazilian System of Conservation Units (SNUC) are broken down into two main classes — strict protection and sustainable use. Collectively these account for 16% of the national territory, but are widely variable in size, ecoregional representation, management strategy, and the degree to which they are threatened by both external and internal human activities. In particular, we examine the variation in habitat conversion rates in both strictly protected and sustainable use reserves as a function of the internal and external human population density, and levels of land-use revenue in adjacent human-dominated landscapes. Our results suggest that in general strictly protected areas are considerably less degraded than sustainable-use reserves, which can rival levels of habitat degradation within adjacent 10-km buffer areas outside, particularly within prosperous agro-pastoral frontiers undergoing rapid economic growth. We apply these results to national scale protected area policy and argue against a range of central-government policy initiatives, motivated by strong external socioeconomic pressures, which threaten to downsize or downgrade many PAs throughout Brazil, thereby contradicting political commitments ratified by the Convention of Biological Diversity.

S28.OC.06

Management challenges and perspectives in Brazilian federal protected areas.

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Brazilian protected areas (PA) face basic problems such as small staffs, irregular budget and poor structure/equipment. Aside from these, there are ways research and management could better collaborate to implement actual management for biodiversity conservation in PA. (1) The importance of management needs to prevail over the ideal of untouchable areas 'where evolutionary processes should develop without human interference', since interference is unavoidable. (2) Management plans need improvements – they are quite rigid, in part to address pressures like infrastructure projects, but also because PA's policies are viewed as commandments, not as assumptions. However, flexibility is necessary to allow for adaptive management, considering uncertainty and knowledge acquired with management experiences. Methods, approaches and speeches that recognize and smartly deal with complexity, uncertainty and knowledge diversity are needed. E.g. determining the carrying capacity in recreational areas can be done establishing strict numbers or identifying methods/parameters that allow for dynamic decisions considering present conditions. (3) Better research questions are necessary. Instead of listing numerous, unlinked questions, we must identify key management and conservation issues, for a set time-frame, integrating researchers, managers and the general public in a building process – e.g. Prioritize exotic species control; landscape management considering fire. (4) Identify what managers should seek to improve knowledge and management capacity: data (e.g. GIS, pollen records, fire/flooding history), and practices (e.g. Learning communities) aiming for 'movies' instead of 'snapshots' of the area. (5) Identify simple indicators for monitoring programs, obtainable by and useful also for local staff, related to management questions. Research and conservation opportunities can emerge from partnerships involving PA and research institutions if management challenges are clearly identified. Study cases involving management of native grasslands; a RAMSAR site and; freshwater turtles will illustrate how directed research efforts can improve conservation. Environmental/research agencies can jointly reinforce such applied research and monitoring efforts.

S28.OC.07

Homeopathy principles in the management of cerrados: tackling the problem using small doses of the problem itself

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Fire is widely recognized as a fundamental selective force in savannas worldwide, what is also true for the Brazilian Cerrado. It is then impossible to exclude it from those ecosystems, as their natural dynamics promotes recurrent fires, and eventually wildfires will come. Fire exclusion in Cerrado is also undesirable for biodiversity conservation, because biological invasions and degradation will certainly occur. Fire management in Cerrado natural preserves still does not exist, and substantial effort has been made to produce and gather ecological information to support fire management, and to convince those in charge of parks and reserves to adopt it.

We carried out a five-year project at IBGE Reserve (Brasília, DF) to evaluate the effects of 20-year cumulative fires at different seasons and frequencies in both soil and herbaceous vegetation. In the most frequently burned areas (biennial fires) we found effects in the vegetation biomass, nutrient composition and fine-roots distribution, and on soil nutrients. Quadrennial fires, however, maintained values very close to those of the unburned area. Fire season showed less relevance to the system.

Invasive African grasses showed higher photosynthetic efficiency compared to native grasses and were benefited by frequent fires in wet years, but in drier years the natives' higher drought tolerance enabled them to overcome the aliens. *Pteridium arachnoideum*, an invasive fern, tended to decrease biomass and litter production at frequent burnings.

Our results highlight the role of fire in maintaining Cerrado dynamics, and the importance of choosing the optimal fire regime when managing for conservation. Considering the devastating effects of wildfires in the fire-protected Cerrado parks and reserves every 4-5 years, and taking into account the knowledge presently accumulated we urge the environmental authorities to establish adaptive fire management programs for Cerrado protected areas so that low-intensity planned fires could lead the system to higher ecological stability and lower risk.

S28.OC.08

Predicting changes in ecological thresholds with a spatially explicit Dynamic Global Vegetation Model

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Modelling vegetation dynamics at the landscape scale is essential for predicting changes in ecological thresholds and for guiding conservation plans. Dynamic Global Vegetation Models (DGVMs) are capable of capturing the effect of climate variations and the influence of natural disturbances and human activities on vegetation dynamics at larger spatial scales. However, for understanding the multiple environmental controls that drive ecological processes, such as the rate of canopy closure and the dynamics of ecosystem boundaries, we need modeling tools developed for more regional scales. We therefore developed a spatially explicit model that incorporates the adaptive Dynamic Global Vegetation Model to simulate vegetation dynamics at the landscape scale by including topographic variation, fire spread patterns and seed dispersal. In an individual based framework, the model simulates biophysical, physiological (C_3 and C_4-photosynthetic pathway) and demographic processes, at the leaf, canopy, population and ecosystem level, in daily time steps. We evaluate the effect of spatial heterogeneity on density-dependent feedback mechanisms linked to fire that arbitrate dynamics of forest-grassland mosaics in South Brazil. Results showed that spatio-temporal density dependent processes linked to fire and topographic properties at the patch scale affected the rate of forest expansion at the landscape scale, constituting an evidence of spatio-temporal variations in ecological thresholds associated to topography. In addition, dynamics of forest-grassland mosaics were sensitive to the spatial arrangement of vegetation patches, showing the strong effect of size and distribution of fire-prone (grassland) and fire-sensitive (forest) patches on defining the availability of conditions under which coexistence is possible at the landscape scale. The use of a spatially explicit DGVM for modelling ecological processes at the landscape scale has shown to be a way forward to explore and clarify the multiple factors affecting ecological thresholds that drive vegetation dynamics and biomes distribution in a changing climate.

S28.OC.09

Kilimanjaro under global change

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Changing weather conditions, large-scale habitat conversion, agricultural intensification and rapid human population growth have reached a critical stage at Kilimanjaro. With our study we aim to reveal feedback loops between these different components of global change, biodiversity and ecosystem functioning using remotely sensed data and ground data of over 1500 vegetation plots.
Decreasing precipitation is the main driver for increasing forest fires in combination with illegal logging activities affecting e.g. fog water collecting capacity and with this, the water balance of the whole mountain. This endangers its function as water tower for northern Tanzania, on which nearly 10 million people depend on.
The Amboseli National Park on Kilimanjaro's northern foothills has experienced sweeping climate and habitat changes. This has caused an increasing migration of elephants from the Amboseli ecosystem into the forests of Kilimanjaro with negative consequences for forest cover. In contrast to the alpine flora, which migrates downslope due to climate change impacts on Kilimanjaro, savanna grasshoppers are spreading from lower elevations to the submontane, montane and even afroalpine zone due anthropogenic opening of the closed forest and a warmer microclimate.

Natural savanna vegetation is increasingly converted into cultivated fields. As a result Kilimanjaro is becoming an island surrounded nearly entirely by cultivation. In the past, a corridor of sub-montane forest vegetation linking Kilimanjaro with Mount Meru facilitated the dispersal of forest animals. Today such movement has been curtailed.

Kilimanjaro's ecosystems will be subject to significant further climate changes, enhancing the above threats. However, these impacts are in many cases exacerbated in form of feedback loops by other global change components. This direct impact of land use change and intensification on biodiversity, ecosystem functioning and livelihood can be assumed to be even stronger than future effects of climate change.

S28.OC.10

Breeding location determines climate change vulnerability of frogs in the Philippine biodiversity hotspot

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Temperature profoundly affects many species, particularly those with highly defined thermal optima. Species may circumvent the impacts of climate change by utilizing microhabitats that buffer extreme temperatures. In this study, we examined an endemic anuran community to identify which species are at greatest risk of suffering physiological stress from climate warming after accounting for the capacity of their habitats to buffer temperature. We identified the critical thermal maximum (CT_{max})—the temperature at which an individual loses normal motor functions—of larvae and adults collected in tropical montane forest on Mt. Banahaw, Luzon Island, the Philippines. The four guilds included direct developing frogs that breed on exposed leaves, direct developing frogs that breed in ferns, and stream and phytotelm (i.e., tree hole) breeders, both of which produce aquatic free-swimming larvae. We derived thermal tolerances from specific microclimates of breeding habitats and compare them to tolerances derived from macroclimate, non-buffered air temperature. We also examined whether differences existed across life-history stages for the two locally endemic direct-developing frog species. The upper thermal physiological limits of anurans were highly dependent on a species' breeding guild as microhabitats typically expanded thermal tolerances by several degrees. Direct-developers were most vulnerable to increased temperatures—indicated by their low CT_{max} and low capacity of their breeding habitats to buffer temperature. Furthermore, direct-developer larvae were more sensitive to warming than other life-history stages (i.e., metamorphs and adults); thus, drawing conclusions on climate vulnerability based on a single life-history stage may be misleading. Since non-buffered thermal tolerances are within range of future warming predictions, microhabitats that buffer temperature may represent the only protection against current and impending climate warming.

S28.OC.11

Protected areas and ecological restoration: a two way path

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Ecological restoration should serve the conservation of protected areas or protected areas should serve to restoration of degraded areas? In the ideal world, I think this should be a two way path: from science and practice of restoration must come the solutions to the challenges related to the expansion and improvement of habitat quality, in order to ensure the maintenance, within the protected areas, of viable populations of endangered species of plants and animals. On the other hand, from protected areas can come models for restoration, ie, the reference models to illustrate how were (biodiversity and functioning) the natural ecosystems which were degraded or destroyed and must be restored outside protected areas. In addition to the models, it is expected that protected areas are both sources of propagules for natural dissemination and for the intentional propagation of genes and species that were extinct in the rest of the territories and should be reintroduced by means of restoration actions. This two-way path, however, requires strict control of input and output of genes and species at risk of, if misguided, result in the creation of new problems instead of solution to the existing ones. The following main topics will be discussed: 1) the risks and expectations relating to ecological restoration within protected areas, 2) the limitations of the use of pristine ecosystems as targets for restoration, 3) the limitations of restoration techniques in the reconstruction of natural ecosystems, and 4) the risks involved and hopes to collect reproductive material within protected areas for use in ecological restoration outside its territorial limits.

S28.OC.12

Ecological restoration of protected areas in developing island nation: how useful is the science?

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Restoration ecology, a relatively young science with a growing popularity, is set to steadily grow in importance owing to both the worsening worldwide trends in habitat degradation and the increasing realization of the need to restore degraded or damaged natural areas for many reasons, including conservation of biodiversity. Of particular concern is that ecosystem degradation has been and is predicted to continue to be most rapid in developing or relatively low income countries. Incidentally, this is also often where much of the world`s biodiversity is concentrated, particularly in the tropics, also where biodiversity is often most at risk and where the least resources are available or allocated to biodiversity conservation and restoration. Here we examine how a developing nation, which may be regarded as well equipped among developing countries in terms of access to resources and restoration science, is using the latter to inform the ecological restoration of its degraded native habitats for biodiversity conservation in protected areas. While the country is known for a number of proactive and at times innovative approaches that may even be setting the pace worldwide, we found that the restoration activities which are impacting the largest areas and overwhelming proportion of its native biodiversity remain avert to sometimes basic ecological principles. This includes for example the removal from restoration areas of fast growing native pioneer species with proven nurse-tree potential to be replaced by nursery grown and much slower growing plants that would have naturally grown anyway. Besides representing setbacks to areas undergoing restoration, this elevates restoration costs. It is important that research worldwide continues to improve restoration science. But it may be even more important to identify and remove limiting factors to ensure that practitioners in developing countries are able to successfully make use of the science to guide actual restoration.

S28.P.01

Estimating the effectiveness of Malagasy protected areas in reducing deforestation

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Madagascar is unique in its levels of endemism and species diversity leading to its classification as one of the highest priorities for international conservation. Most of the island's endemics are exclusive to forest ecosystems and are currently threatened by severe rates of forest loss. Setting land aside in protected areas is a cornerstone in addressing the current deforestation crisis. However, protected areas are only effective in maintaining viable populations if they successfully impose land-use restrictions that prevent the pervasive impacts of human activities. In this project we make use of a countrywide forest cover and clearance classification based on Landsat imagery from c.1990, c.2000 and c.2005 to estimate the efficiency of 45 of the island's 46 legally established protected areas in preventing or reducing deforestation.
For the c.1990-c.2000 period, annual percentage forest loss was found to be significantly lower within protected areas than in surrounding forest lands at 1, 2, 4, 8 and 16 km from protected area borders (0.2±0.35 vs 0.7±0.86, 0.78±0.95, 0.9±1.25, 0.91±1.21 and 0.89±1.06 respectively – mean±1SD) whereas in c.2000-2005 deforestation in protected areas was only significantly lower in relation to further forests at 4, 8 and 16 km (0.13±0.29 vs 0.41±0.72, 0.43±0.61, 0.47±0.64 respectively). Overall percentage of annual forest loss in c.2000-2005 was significantly lower than in c.1990-c.2000, this reduction being especially noticeable in the 1 km buffer adjacent to the protected areas were the rate of forest clearing decreased by roughly 60% in relation to the first period. Different deforestation drivers seem to have played a role in the two periods, but overall, protected areas are being effective in reducing deforestation and apparently are also having a positive influence on the immediately neighboring lands.

S28.P.02

Comparative analysis of cost and viability of different management techniques to control the invasive grass Melinis minutiflora in the Cerrado Conservation Units

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The effects of human-induced disturbances are of special concern due to the resulting loss of biodiversity and degradation of ecosystem services. A typical example of cumulative anthropogenic impact occurs in tropical savannas, especially in areas that are burned or logged and then used for livestock grazing. Some African grasses introduced in the Brazilian savannas for cattle feeding became invasive, with *Melinis minutiflora* being the most common example widely spread all over the region. The presence of this invasive grass is almost certain in most Conservation Units established in the Cerrado region, turning to be fundamental to look for effective treatments to reduce its coverage. The objective of this study was to evaluate the costs and efficiency of seven methods for molasses grass management proposed in the literature: integrated control method (cycles of burning and herbicide), annual cutting, clipping once, and twice, clipping and soil digging once, and twice, and mugging. The cost (based on a hectare of land/year) of each method was calculated taking into account materials, tools and labor. Due to the high regenerative capability of molasses grass a monitoring program of at least two to three years is necessary to reduce its biomass. Therefore, the comparative analyses of cost and viability of the methods indicated that to controlling molasses grass the best benefit/cost value for large areas was the coupling of integrated control method and annual cutting with the option of renting a micro-tractor. The mugging method showed to be economically viable only for small areas. Overall, the management cost showed to be relatively low compared with the potential negative impact of the molasses grass on the relationship between the Cerrado ecosystem functioning and its biodiversity fundamental to maintain several ecosystem services.

S28.P.03

INTEGRATING LOCAL KNOWLEDGE IN LAND USE PLANNING THROUGH A COLLABORATIVE APPROACH IN PAPUA, INDONESIA

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In the tropics, conflict over land use frequently leads to the loss of forest resources. Policy makers rarely consider indigenous people's knowledge and perceptions when developing decisions that affect the forested landscape. Bridging the gap between official land use planning and local priorities is pivotal to bolster development programs while maintaining ecosystem functions that provide goods and services.

Mamberamo Raya District in Papua, Indonesia encompasses 2 million hectares, more than 90% of which is forest with exceptionally high biological diversity and endemism. It is a sparsely populated new district following the decentralization process where official land use planning is currently being developed. We worked in 5 villages representing different ecosystems and conducted participatory mapping, focus group discussions, and interviews to explore how local authorities' and communities' perceptions can be integrated from the design to the implementation of spatial planning.

We produced a series of maps showing the ways local communities in our study villages currently use their land and their vision of land use changes in the future. These maps are keys to: (i) encourage discussion among stakeholders concerning collaborative land management at the village level, and (ii) allow local authorities to define appropriate and feasible land management targets and determine ecologically sustainable development in the region.

S28.P.04

Reconciling customary land and conservation around the Manusela National Park in Seram Island, Indonesia

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In many conservation areas in the rural tropics, overlap between customary and state land allocation has caused conflict between communities and governmental agencies dealing with the management of natural resources. Manusela National Park (MNP), in the central part of the Island of Seram in the Moluccas, is no exception. In the vicinity of the park, conflicting land use between these stakeholders has impacted negatively on both livelihoods and forest resources.

In the framework of an action research programme developed to facilitate collaborative agreement on land allocation and use, ten communities living on the periphery of the MNP were studied - using household questionnaires, focus group discussions and key informant interviews. While different historical and cultural issues were evident at each village, access to forest benefits is increasingly difficult for all villages. Despite high community awareness and willingness to conserve the forest, collaborative actions between the relevant government bodies, including the national park management and communities has, to date, been limited.

Through collaborative land use planning, creating opportunities for generating benefits from alternative land uses (trade-offs) and the realisation of additionalities from ecosystem services (using REDD++, PES and private sector opportunities) these issues could be addressed. Involving communities in land use planning and implementation, working to ensure that additional benefits (such as payments for ecosystem services), could help to maintain forest cover for the benefit of environmental services to the communities today and in the future.

S28.P.05

Impact of Household Behaviour on Biodiversity Conservation

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Natural resource base in Rwanda is a vital source of domestic and national income, providing the basis for farming, fishing, energy production and tourism. However, resources have been degraded due to high demand for agricultural land and home energy use, resulting from high population density and growth (on average about 310 people per km^2) and lack of effective policies to preserve biodiversity.
Rwanda is well known for its rich biological diversity, and in particular for being home to one of the last two remaining populations of wild mountain gorillas (Gorilla beringei beringei) in the World. The need to protect mountain gorillas and their natural habitat led to the creation Volcanoes National Park (VNP) in 1925. The main objective of this study was to analyze how household characteristics and behaviour of adjacent farming communities impact on VNP. A total of 95 households were included in the survey and selected using a multi-stage sampling process. The main resource collected from VNP changes from one sector to another and from time to time. However, majority of respondents use water from VNP as a major resource at (48.4%). Above 70% of households near VNP are farmers and doing other economic activities related to VNP. Education level does not affect VNP conservation only but also other socio-economic characteristics.
Socioeconomic characteristics are evaluated as a combination of factors including income, level of education, family size and occupation. Individuals or households fit into society using economic and social measures that have been shown to impact on biodiversity conservation. This study established that bamboo cutting is the most common illegal activity carried out in VNP by communities living adjacent to the park. In conclusion, sharing tourism revenues and developing alternative household income generating projects would be the main solutions to overcome illegal activities within the national parks.

S28.P.06

A new land cover transition model scheme for Southeast Asian tropical forest conservation with scenario approach

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Tropical forests in Southeast Asia are decreasing rapidly in area mostly due to anthropogenic land use change (e.g., forest clearing, plantation development). The forest reduction in this region causes serious damage not only to the life of local inhabitants but also to the global environment. To consider the options we should choose for the tropical forests conservation in an ecologically sustainable way, we need a tool to project future pictures for different scenarios with multiple strategies we might take now. In this study we present a mathematical model scheme for land cover transition and the evaluation in the relevant aspects with case study of Sarawak, Malaysia. The core of the model is a transition matrix of typical land covers, that is, mature dipterocarp forest, its early succession phase, agricultural lands in traditional form and Modern Plantations (including oilpalm, rubber and so on). Each element of the matrix describes the transition probability per year between each pair of land cover types expressed with functions and parameters of both natural and anthropogenic factors which were estimated from comparison of two land cover maps of different ages. As previous studies, our results also could show quite various land cover proportion as future projection for rather small difference in land use alteration scenarios. Our model, in addition, could clearly demonstrate that the rate of land cover change is quite dependent on the function type for land cover transition. If we incorporate positive/negative feedbacks in the functions for inhabitants' land cover dependence, for example, we might have much faster/slower transitions. We argue that more discussion about function types of land cover transition must be made for feasible and sound conservation planning of forests in Southeast Asian tropics.

S28.P.07

Mountain gorilla's food abundance variability over space and time in Volcanoes National Park, Rwanda

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The aim of this study was to evaluate changes in abundance over time and space of mountain gorilla food plants in the Volcanoes National Park (VNP), Rwanda. We sampled 120 nested plots equally distributed in six different habitats. Prior to this study, Plumptre et al. (1991) sampled the same area, and we used the same data collection methods for comparison, to determine if there has been change over time of gorillas food availability and abundance. We sampled the density of all major gorilla food plants and the length of each stem and leaf for tall plants. The biomass of vines in each plot was obtained by harvesting the parts eaten by gorillas, drying and weighing them. The biomass of stems and leaves of all tall herbs was obtained by using dimension analysis. For 10 major gorilla food plants, differences in biomass among habitat types were significant. Gorilla food was abundant in Hagenia-Hypericum woodland and the herbaceous area habitats with the highest biomass of Crassocephalum ducis-aprutii (66.4g/m²), Carduus nyassanus (17.5g/m²) and Laportea alatipes (18.3g/m²) while the lowest absolute biomass was found in the meadow. In comparison to 1991, biomass of gorilla food plants declined by 68%. Galium species, the most important gorilla food plants that make up roughly 30% of gorilla diet, decreased by 32%. Plant biomass declined with altitude, with an average of 48.5g/m² per plot at the lower altitude and 17.8g/m² per plot at higher altitude. Former subalpine zones which has low gorilla food availability in 1991 have started to be progressively colonized by some plant species initially restricted to lower zones. This change may be related to global warming with an average of 0.7oC temperature increase since 1989. Climate change might play an important role causing migration of plants species from lower elevations towards upper zones.

S28.P.08

Effectiveness of terrestrial protected areas for fish fauna preservation

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The creation of terrestrial protected areas in preserving terrestrial fauna and flora is a well accepted conservation tool. However, in South America, some terrestrial protected areas were created with purpose to protect fish fauna (especially those migratory) as a compensation of river damming. That is the case of the Rio Ivinhema State Park (Upper Paraná River floodplain) created to preserve this wetland remnant that has a key role in maintaining viable population of fish species. Besides the several dams upstream in the basin, the flood pulse is still the main function force determining ecological processes. The Ivinhema River (target) and Baía River (sentinel) were selected to assess whether the creation of the Rio Ivinhema State Park was effective for the conservation of fish fauna from the lotic remnant of the Upper Paraná River (between Porto Primavera Dam and Itaipu Reservoir). Samples were taken during three different periods (1986 to 1988 - Period 1, 1992 to 1995 - Period 2, and 2000 to 2005 - Period 3). It was evaluated the hydrological regime of rivers, and metrics such as species richness (number), abundance (proportion) of large migratory species, and similarities in the structure of fish assemblages. The species richness increased in the region of the park and outside of it. The long-distance migratory species had a sharp decrease in their proportions over time, with lower values where the park was created. The similarities between the samples evidenced the benefits of creating the park in the Period 3. Therefore, the creation of the Rio Ivinhema State Park played its role for fish fauna conservation, especially for the long-distance migratory species. However, the creation of conservation units in highly regulated rivers such as the Parana River is only effective if their natural processes are also recovered, as the floods, in this case.

S28.P.09

Conservation Status of the Permanent Protected Areas of the Coqueiral Natural Reserve, Minas Gerais, Brazil

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The Atlantic rainforest is known to be a highly fragmented tropical forest. Even the Permanent Protected Areas (PPAs) have been affected by deforestation and fragmentation. In Brazil, according to environmental legislation, PPAs are riparian areas, hilltops and steep slopes that must be preserved due to their importance in maintaining environmental functions such as preserving water resources, landscape and geological stability, biodiversity, gene flow of wild fauna and flora, soil protection and ensuring the welfare of human populations. Unfortunately, Brazilian legislation is not fulfilled and a large part of these areas have been deforested. It is very important to restore the PPAs in order that they may continue providing ecosystem functions and services. In this sense, this study aimed to verify the status of the Permanent Protected Areas (PPAs) of the Coqueiral Natural Reserve, located in Coqueiral, southern Minas Gerais, Brazil. We used Remote Sensing and Geographic Information Systems to elaborate land use maps and verify the status of the PPAs associated with watercourses and slopes greater than 45°. The thematic maps were developed using a SPOT satellite image, IBGE topographic maps and SRTM - NASA. Our results show that about 15.31% of the Natural reserve should be preserved as PPAs. However, 45% of these areas are inconsistent with the current Brazilian Environmental legislation. The pasture was the dominant land use class and occupied 37% of the PPAs. Coffee covered about 11% of the Natural reserve and only 3.25% of PPAs. This data is relevant for decision makers responsible for the management and planning of the Coqueiral Natural Reserve, and will allow them to determine priority areas for conservation and restoration, which is of great importance as the PPAs are extremely important in maintaining ecological functions.

S28.P.10

COMPARISON OF THE BIRD ASSEMBLAGES SAMPLED IN SELLECTIVE LOGGING AND PRESERVED SITES IN FLORESTA NACIONAL DO JAMARI – RONDÔNIA – BRAZIL

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We report here the research findings comparing the bird assemblages in preserved and selective logging managed areas in Floresta Nacional do Jamari Reserve – Rondônia – Brazil. We compared the structure of bird communities (richness, abundance and composition) by sampling four areas of selective logging (one year after cut) and four preserved sites (in the preservation area of the Reserve) using 12 mist nets and 8 point counts in two expeditions in 2011 (total of 1152 mist net/hours and 63 point counts). We captured by mist nets 397 bird individuals of 51 species. The most abundant species in selective logging sites were *Pipra rubrocapilla* (n=16), *Glyphorynchus spirurus* (13) and *Xiphorhynchus elegans* (11). In preserved sites we found the most abundant species as *Dendrocincla merula* (17), *Glyphorynchus spirurus* (12) and *Willisornis poecilinotus* (11). We also recorded by point counts about 900 individuals of 130 bird species. The most abundant species in selective logging sites were *Hypocnemis ochrogyna* (25), *Cercomacra cinerascens* (19) and *Monasa morphoeus* (15). In preserved sites we found the most abundant species as *Aratinga widelli* (38), *Cercomacra cinerascens* (36), *Lipaugus vociferans* (22) and *Myrmotherula sclateri* (20). Using MDS ordination analyses and Anosim tests, we found no significant differences in the communities sampled by mist nets in the two treatments, however point counts data showed statistical differences between bird communities sampled in selective logging and preserved sites. Although we are still refining the analysis and continuing our sampling in 2012, it is important to consider that despite this type of timber management is not considered as a heavily impacting exploitation, selective logging can be slightly changing (in a short term) the bird communities in managed areas of Floresta Nacional do Jamari.

S28.P.11

The Contribution of Protected Areas to the Livelihoods of the Adjacent Communities:(Case study of Volcanoes National Park in Musanze District, Northern Province of Rwanda).

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Most of Rwandan protected areas are located in remote areas where poverty prevails. It is widely accepted that sustainable development and conservation of those protected areas should be taken together because they are interlinked. Protected areas generate incomes, which can help adjacent communities to improve their livelihoods.
The main objective of this study was to assess the contribution of Volcanoes National Park to the Livelihoods of Adjacent Communities. This study was conducted in Musanze District specifically in four sectors namely; Nyange, Kinigi, Shingiro and Gataraga. Questionnaires were used obtain important information on contribution of VNP on adjacent communities. Simple random sampling and purposive sampling was used in this research, in total 72 household heads were interviewed.
The results indicated that communities adjacent to VNP receive a number of tangible and non-tangible benefits through ORTPN and other conservation donors. These benefits include support of community from income generating activities, access to forest resources like water, basic infrastructure such as water tanks, schools and jobs, and all these helps community to improve their livelihoods. Community dependence on resource from the park is influenced by location, education, and years of staying, however it was found that the influence is not statistically significant.
Strategies to reduce dependence on VNP would thus be focussed on finding alternative ways to meet the demands of adjacent communities in order reduce encroachment to the national park.
Enhancing community innovation to foster entrepreneurship development and off-farm and non- farm employment opportunities would also serve as another development strategy to reduce dependence on the park. Other mitigation measures would include increasing access to enough and safe water for domestic use, establishing medicinal gardens, and promotion of modern stove and biogas as source of household's energy.

S29.OC.01

Human disturbances and novel ecosystems: prospect for tropical biodiversity and ecological services

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Tropical forest landscapes are subjected to unprecedented rates of human-induced environmental changes resulting in the proliferation of highly-modified species assemblages and ecosystems. Such novel ecosystems have emerged in response to biological invasion, species loss due to habitat fragmentation and species overexploitation, among other forces. In fact, novel ecosystems may be the predominant habitat across tropical regions even in the presence of net forest gain (i.e. forest transition). This perspective poses many questions relative to long-term persistence of tropical biodiversity and provision of ecological services in human-modified landscapes. While much has been elucidated about species loss and biological invasion in human-modified landscapes, the ultimate nature of novel ecosystems, as well as the threats and opportunities they represent remain obscure. In a nutshell key issues are (1) the novel ecosystem concept: scope and relevance, (2) the forces driving the emergence of highly modified assemblages and altered ecosystems, (3) novel ecosystem: eradication, control or valorization, and (4) threats versus opportunities for native biodiversity and ecosystems services in human-modified landscapes. Here we extend the concept of novel ecosystem by including those supporting species assemblages experiencing increasing dominance of native species in response to human disturbances (i.e. proliferation of pioneer plants). We also address potential driving forces and the multiple consequences imposed by pioneer proliferation and the collapse of old-growth flora. By causing biotic homogenization and biomass collapse at multiple spatial scales such replacement poses clear threats for the persistence of tropical biodiversity and ecosystems services in human-modified landscapes.

S29.OC.03

Do novel forests have similar functioning to native secondary forests?

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Novel forests result from natural regeneration in abandoned cultivated lands that contained introduced species. There is controversy whether novel forests have similar ecosystem functioning to that of native secondary forests of the same age. I hypothesized that juvenile plants of introduced species have higher survivorship, and that novel forests have higher tree growth, higher litter fall, and faster biomass turnover than native species and native forests, respectively. I studied novel forests of *Castilla elastica*, an introduced tree in Puerto Rico, comparing with native secondary forests in the literature. I estimated the survivorship of juvenile plants (1-m^2-plots; n=12), tree growth (diameter at breast height; n=320), and the aboveground litter dynamics (litter fall baskets emptied biweekly; ground litter monthly samples [n=20; 0.25 m^2]) of two stands. The survival percentage of native juvenile plants was higher than that of *C. elastica* (50 vs. 30%). Stand growth in the novel forest was slightly higher than that of the native forests (2.9±0.5 vs. 2.6-2.8 Mg $ha^{-1}year^{-1}$). Species had similar tree growth except for *Guarea guidonia* (22±6 cm^2 $year^{-1}$; n=34) that grew faster than *C. elastica* (5.5±1 cm^2 $year^{-1}$; n=212 [q=3.2; $p \leq 0.05$]). Litter fall was moderate (9.6±0.5 vs. 7.3-12.6 Mg ha^{-1} $year^{-1}$), but litter turnover was faster (2.1 *k* $year^{-1}$) in the novel forest than in native forests (1.5-1.9 *k* $year^{-1}$), especially for leaves and reproductive parts (≈5 *k* $year^{-1}$). Biomass turnover of *C. elastica* was almost double that of native species (5.8 vs. 3 *k* $year^{-1}$). *Castilla elastica* had a dominant effect in the functioning of novel forests while providing conditions for the establishment and development of native species. Forests of *C. elastica* are more dynamic than the compared native forests. Novel forests differ in the rate of processes from that of native secondary forests, but the differences do not add up to negative scenarios.

S29.OC.04

Prospects for modified forest ecosystems: selectively logged forests - and not secondary forests - sustain high levels of tropical biodiversity

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Rampant rates of deforestation and forest degradation have rapidly converted the world's remaining primary tropical forests into modified forest ecosystems, with potentially dire consequences for tropical biodiversity. Today, tropical landscapes are increasingly dominated by secondary forests and selectively logged forests. Using a recent meta-analysis of 138 studies spread across 28 countries pantropically, here we contrast the value of selectively logged forests and secondary forests in sustaining tropical biodiversity. Using pairwise comparisons of biodiversity values, we compared these two modified forest types with adjacent primary forests (with little or no human disturbance) to assess their value relative to undisturbed forests. With a small effect size of just 0.11, selectively logged forests sustained relatively high levels of biodiversity. In contrast, secondary forests had a intermediate effect size of 0.41, suggesting that they in general perform rather poorly in supporting tropical biodiversity. Our results clearly indicate that when it comes to maintaining tropical biodiversity, there is no substitute for primary forests. However, restoration efforts can also be effective, but must be targeted at appropriate modified forest types. Our analysis indicates that selectively logged forests hold the greatest potential, while the value of secondary forests appears limited.

S29.OC.05

Effects of road paving and land tenure on forest value in the tri-national frontier region of southwestern Amazonia

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Roads are a major transformative feature generating novel ecosystems in tropical forest regions, as they accelerate not only deforestation but also forest degradation by increased access to timber and other forest resources. Yet under some scenarios, the connectivity provided by roads can also facilitate development initiatives that improve livelihoods while maintaining forest structure and function.
We evaluated the impacts of road paving on forest structure and resources in the southwestern Amazon, focusing on the tri-national “MAP” frontier, so named after the three states that constitute this region: Madre de Dios (Peru), Acre (Brazil) and Pando (Bolivia). We established 68 0.5-ha permanent vegetation plots in human communities stratified across the land tenure systems in each country and distributed along the Inter-Oceanic highway from Puerto Maldonado, Peru to Rio Branco, Brazil. We worked with community members to inventory forest plots in their settlements at different distances from the road. We calculated four indices of forest value for each plot, including aboveground biomass, timber volume of the regionally important commercial species, estimated production of *Bertholletia* nuts, and estimated yields of *Hevea* rubber.
We found that effects of distance to road on forest value depended strongly on country and land tenure type. Our results complicate simple understandings of the impacts of roads on forests, and they underline the complex relationships between increased connectivity and forest degradation. We discuss scenarios under which forest degradation in the region may be slowed without negatively impacting livelihood options.

S29.OC.06

Maintenance of tree species diversity in a strongly fragmented rainforest

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Understanding how species diversity may be maintained in fragmented tropical landscapes is necessary for biodiversity conservation. We evaluated changes in plant species diversity (number of species and phylogenetic composition) in 45 rainforest patches (1-700 ha) located in three fragmented landscapes with different deforestation levels (4-24% forest cover) located at Los Tuxtlas, Mexico. We first assessed the importance of small (<5 ha) forest patches for the conservation of regional plant diversity. Second, we used an additive diversity partitioning approach to evaluate changes in α-, β- and γ-diversity according to deforestation levels. Finally, we tested whether local species density (species per 0.1 ha) and phylogenetic structure and diversity differed among landscapes, whether they were related to patch area, and whether the relationships differed among landscapes. A great portion of regional plant diversity was located in small forest patches, with communities dominated by native plants, including endangered and economically important species. Species density in the smallest patches varied among landscapes, and hence, the conservation value of a patch may depend on the remaining forest cover in the landscape. Most of the species were restricted to few patches, resulting in a very high species turnover (β-diversity) between patches and landscapes. In fact, at regional scale β-patches and β-landscapes accounted for ca. 83% of total diversity. Overall, the observed differences in sapling and adult species densities across forest patches and landscapes (e.g. lower species densities in smaller patches) resulted in few and very weak changes in the phylogenetic community structure and diversity, indicating that local extirpation of tree species may occur randomly or uniformly (but not in a clustered manner) throughout the phylogenetic tree. We argue that in this unique Neotropical region, both large and small rainforest patches are critical for conserving regional tree species richness and evolutionary history.

S29.OC.07

Conserving biodiversity in secondary tropical forests: constrains and possibilities

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One conspicuous component of human modified landscapes (HMLs) in the tropics is secondary forest (SF) regenerating on abandoned agriculture fields. It has been said that: i) SF may harbor important levels of biodiversity, ii) SF could dominate future HMLs because migration of rural people to urban areas are leaving increasing land available for forest regeneration, and iii) as a result, SF may play a paramount role in biodiversity conservation. However, these issues need to be carefully addressed because: i) abandonment is still uncertain and can be transient (e.g. under incentives for intensive agriculture systems), ii) forest regrowth could not operate across all abandoned lands, because tipping points for natural regeneration have already been surpassed (e.g. in degraded lands and or in HMLs with scare or non-existent old-growth forest remnants), and iii) SF may become biodiversity impoverished ecosystems. Here, we address these issues through a literature review and using our results from three study cases, two tropical rain forest and one tropical dry forest regions in Mexico. Our studies indicate that biodiversity recovery depends on disturbance regimes inflicted by agriculture practices and the remnant old-growth forest. SFs regenerating on abandoned land undergone low impact agriculture immersed in HMLs with important remnants of old-growth forest, recover over few decades important levels of species diversity, abundance, and functional attributes of plants and animals, upholding important pools of old-growth forest species. In contrast, the recovery is quite limited in abandoned lands used previously for extensive (large cattle pastures), intensive agriculture (e.g. pastures for milk production) or that suffered recurrent cycles of use-abandonment, especially on poor soils. We discuss that conservation of biodiversity in SF will be given by win-win balances between socio-economic and ecological factors that may enable sustainable land uses and the promotion of policies for the conservation of old-growth forest remnants.

S29.OC.08

Old and novel ecosystems in the southern Brazilian grassland biome

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The southern Brazilian grassland biome contains highly diverse natural ecosystems that have been used during centuries for grazing livestock and that also provide other important services. I review the main factors controlling ecosystem processes in these grasslands and discuss whether and how the concept of novel ecosystems applies. These grassland ecosystems form mosaics with forests that are expanding to the south since mid Holocene due to more favorable climatic conditions. The dynamics of these ecosystems is associated with the occurrence of certain levels of disturbance by grazing and fire. Fire has occurred since the early Holocene, probably of anthropogenic origin, and grazing by livestock is present since its introduction in the seventeenth century. Large herbivorous grazers have co-evolved with the species of grasses in South America since the early Miocene. Grazing by large grazers, therefore, is not a novelty in the evolution of the species, and the conjecture that domestic cattle may represent the reintroduction of a process performed before by mega faunal grazers is plausible. The conservation of these grasslands has been neglected. By 2002 their conversion into agricultural and silvicultural uses reduced the remaining natural grassland vegetation cover in the state of Rio Grande do Sul to about 50% of the original, and a similar rate of conversion has likely continued up to now. Besides habitat loss, conversion has also spawned fragmentation, with likely consequences on patterns of biodiversity and on the increase in species extinction risks. Furthermore, the grasslands are affected by invasion of species such as exotic grass *Eragrostis plana*. Conservation areas in the state of Rio Grande do Sul currently protect less than 1% of these grasslands and most of the conservation of these ecosystems is on the hands of private farmers that use traditional grazing management.

S29.OC.09

Can a single herbivore species make a difference? Leaf-cutting ants as promoters of novel neotropical forests.

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Despite the undisputed relevance of herbivory as key ecological process, the potential changing role of herbivores in human-modified ecosystems is still poorly understood. For example, the common perception of reduced herbivory levels in fragmented forests is challenged by the emergence of a small set of winner herbivores with potentially far-reaching implications for the functioning and progression of novel ecosystems. Here we present LCA as prime examples of novel ecosystem promoters, i.e. species that not only reach hyper-abundance following the conversion of continuous into fragmented forests, but in turn act as synergistic amplifiers of anthropogenic disturbance regimes. Compiling quantitative results on the multi-layered activities of leaf-cutting ants in neotropical forests, particularly in the Brazilian Atlantic Forest, we (1) demonstrate how they ultimately help to promote the proliferation of pioneer-type tree species *via* a combination of trophic impacts (herbivory and seed dispersion) and ecosystem engineering (nest mediated changes in microclimatic and edaphic conditions) and (2) try to elucidate the contextual attributes (environmental and anthropogenic factors as well as LCA species traits) that determine/modulate the degree of their ecological release. In view of their omnipresence and ability to affect plant performance (from individual to assemblage level), LCA shed new light on the relevance of insect herbivores for the functioning and the successional trajectory experienced by novel tropical forest ecosystems.

S29.OC.10

Interactive effects of anthropogenic disturbance and invasion: fire, invasive ants and native ant diversity in New Caledonia

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Biological invasion and anthropogenic disturbance often go hand-in-hand, making attribution difficult in relation to associated biodiversity decline. Rather than being the primary 'drivers' of biodiversity decline, invasive species may merely be 'passengers' of anthropogenic disturbance that has already caused the biodiversity decline. Alternatively, invasive species may interact with disturbance as 'back-seat drivers', where disturbance-induced habitat degradation facilitates invasion, but invasive species then cause further degradation. We examine the interactions between anthropogenic disturbance, invasive ants and native ant diversity in New Caledonia, one of the world's earliest recognized biodiversity hotspots. Since the arrival of people 3500 years ago, anthropogenic fire has resulted in the loss of about half of New Caledonia's original subtropical forests, which are characterized by high species diversity and exceptional levels of endemism. Many of the disturbed sites are dominated by exotic ants, especially *Wasmania auropunctata* and *Anoplolepis gracilipes*. We describe the interactive effects of an extensive wildfire and invasive ants on native ant communities in forest and shrubland on ultramafic soils, as well as the relationship between invasive ants, edge-effects and native ant diversity along a rainforest restoration front on volcano-sedimentary soils. Our results support the back-seat driver model of invasion impacts, with fire likely to facilitate invasion by exotic ants, but then exotic ants driving further biodiversity loss and blocking ecological restoration.

S29.OC.11

Effects of habitat fragmentation on avian disease and vector communities in tropical rainforests

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Habitat fragmentation has been found to influence the structure and composition of many tropical taxa. While we know a great deal about the primary effects of fragmentation on plant and animal communities, we actually know very little about the secondary or indirect effects of landuse change on communities. Emerging infectious diseases are thought to be facilitated by novel interractions between diseases, vectors and hosts often as a direct result of landuse change. In this study I explore how habitat fragmentation in tropical Australia has influenced mosquito communities and disease prevalence in rainforest birds. Four novel pathways for disease transference through mosquito communities will be discussed along with suprising results on how fragmentation affects disease prevalence in rainforest birds.

S29.OC.12

Ecological restoration efforts to mitigate biotic homogenization in human-modified tropical landscapes

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The historical process of anthropogenic-induced environmental changes has brought important challenges for biodiversity persistence and effective provisioning of ecosystem services in human-dominated tropical landscapes. Accordingly to the new concept of novel ecosystems, some of the biotic and abiotic alterations driven by this process may be irreversible over time, and then poor and less complex ecosystems should inevitably be accepted as part of a new ecological world order. However, some of these ecological thresholds could, and should, be overcome by adaptive management as part of ecological restoration efforts. Therefore, ecological restoration arises as a tool for saving high-diversity tropical forests from irreversible impoverishment of their composition, structure, and function. In this presentation, we will use some case studies of the Brazilian Atlantic Forest to defend the assumption that we have to adopt a more active position to face the problem of biotic homogenization and novel ecosystems formation in such scenario. Some of the strategies presented involve the control of invasive species, substrate rehabilitation, enrichment plantings, and landscape planning. In a nutshell, more positive human intervention is needed in collapsing ecosystems. Hence, instead of just describing and lamenting the transformation of unique tropical forests into inevitably poorer ecosystems, we now have to invest more in the science and practice of adaptive management in order to avoid, or at least mitigate, a massive simplification of ecosystems embedded in human-dominated tropical landscapes.

S29.P.02

Phytoremediation and biomonitoring of water contaminated by chromium: symptoms and internal morphology evaluation of *Polygonum punctatum* Elliot.

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Toxic metal pollution poses a major environmental and human health problem. These elements can contaminate different ecosystems, which may be partially solved by the emerging phytoremediation technology. This cost-effective plant-based approach to remediation takes advantage of the remarkable ability of plants to concentrate by absorbing elements and compounds from the environment and metabolizing various molecules in their tissues. This paper aims at developing a database of phytoremediators; the selection of a macrophyte, the analysis of the remaining Cr(VI) ions after the absorption process by the plant and observation of symptoms, analysis of pigments and internal morphology of the studied species. Based on the analysis of the previous published work concerning this subject, it has been found that 34 of the vascular plant species used in heavy metals remediation, only 23.5% were native and 14% spontaneous, showing a prevalence of exotic plants (62.5%). The results indicated that phytoremediation technology is still expanding in Brazil and it presents a potential for its exploitation on the basis of national biodiversity. In this present work, fragments of selected species, *Polygonum punctatum*, were stimulated to bud. The shoots were transferred to nutrient solution and subjected to treatments of 0.1, 2 and 5 $mg.L^{-1}$ of Cr (VI). The results showed that at 2 and 5 $mg.L^{-1}$ Cr(VI) solutions, shoots presented symptoms as wilted leaves and stomata, epidermal cells, and druses of leaves were damaged. These results showed that these symptoms of *P. punctatum* can be used for biomonitoring when they are in areas contaminated by chromium. Moreover, the species appears to be tolerant to concentrations less than 2 $mg.L^{-1}$. In conclusion, the results showed that the studied species are promising to be used as a phytoremediator.
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S29.P.03

Patch area and micro-topography importance for microclimatic expressivity of small fragments at fragmented Atlantic rainforest landscape, Brazil

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Change on microclimate at fragmented landscapes is one of the most important factors affecting the distribution and abundance of many tropical rainforest species, that have the quality and quantity of their original habitat diminished after fragmentation process. Based on the patch area importance for microclimate maintenance on forest patches, we hypothesized that (1) microclimate of small patches is affected by different micro-topographical factors than high forest covered patche, and (2) patch area became the main landscape factor driving microclimate variables at small patches. Using 84 sample plots distributed on 12 remnants in a fragmented Brazilian Atlantic rainforest, first we assess the effects of micro-topographical metrics (geographical aspect, edge distance, altitude and terrain slope) on microclimate (temperature, humidity, vapor pressure deficit and diffuse light transmitted) of a high forest covered patch (3 500ha) and 11 small forest patches; and second, the effects of landscape metrics (patch area and connectivity) only on microclimate of small patches . Our findings shown that microclimate variables at forest covered patch are significantly affected by edge distance, terrain slope and altitude. Differently, microclimate variables at small patches were wildly variable (15.43 to 29.14% of variance on the GLMM model) and were minimally affected by such micro-topographical metrics. Further, patch area was the most important landscape metric driving the microclimatic expressivity at small patches. Our results support the idea that micro-topographical factors exert more comprehensible effects in habitats with high forest cover than in small patches, and suggest there is a threshold of area that rule the importance of these spatial metrics on the microclimatic expression on remnants of fragmented landscapes.

S29.P.04

Plant species diversity and the desertification process at Caatinga northeast Brazil

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Human activities that generate disturbances in the landscape have triggered the process of desertification in the Caatinga. Environmental conditions that can promote vegetation recovery after disturbances in semi-arid regions are annual rainfall and soil fertility. Additionally, diversity of woody plant species can improve vegetation recovery increasing the probability that resilient species remain in the system after disturbance This study aimed to test the hypothesis that, after accounting for the influence of mean annual precipitation and soil fertility, woody species diversity would be negatively related to the percentage of bare soil in the Caatinga biome. Species diversity was estimated by modeling geographical ranges of 361 woody species that occur at the Caatinga domain using MaxEnt (presence-only technique). The presence data were obtained from the SpeciesLink website. We obtained percentage of bare soil in the landscape data from MODIS website, mean annual precipitation data from the WorldClim website and soil fertility data from the Brazilian Ministery of Environment (MMA) website. We modeled the effect of the environmental variables and species diversity on percentage of bare soil at a resolution of 0.5° using generalized linear and non-linear (exponential) least square regressions with exponential error structure correlation. The exponential model had greatest accuracy to predict the percentage of bare soil explaining 60% of the variation indicating that the effect of these variables are multiplicative. Precipitation had a strong negative effect while the negative effect of soil fertility was less accentuated. Species diversity had no effect on percentage of bare soil. These results indicate that the influence of plant diversity on ecosystem recovery may not operate at the scale studied and that water availability is the main factor jeopardizing vegetation recovery.

S29.P.05

Percentage of impervious surface soil as indicator of urbanization impacts in Neotropical streams.

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Several recent studies in the northern hemisphere have shown that the area of impervious surface soil (IS) is a surrogate for the urbanization impact on streams. In order to test this in Neotropical streams, we assessed whether the increase in IS reduces the diversity and simplifies the trophic structure of the insects community composed by the Orders Ephemeroptera, Plecoptera and Trichoptera (EPT). Nine streams with a gradient in IS from 34.8% (100% urbanized) to 0,5% (non-urbanized) were analysed. The streams were classified in High IS (HIS), formed by the group most impacted by urbanization, whose sub-basin presented IS > 9%, and Streams with Low IS (LIS), which have little or no impact from urbanization, whose IS of the sub-basin was < 2%. The relationship between EPT taxonomic richness and IS was graphically analyzed and the significance tested by means of a Spearman correlation. Both the difference between the groups HIS and LIS, and the faunal homogeneity within each group were tested by PEMANOVAs. A IS threshold was detected between 1.6 and 9.3%, characterized by a sharp decrease in taxonomic richness, faunal homogenization, and simplification of the trophic structure of the EPT community. Among the 27 genera identified, only 15 occurred in streams with IS > 9%, while 24 genera were registered in streams with IS < 2%. The trophic guilds of predators and shredders were not observed in streams with high IS, decreasing from 5 to 3 the number of guilds in these streams, compared with the streams with low IS. Based on the low IS threshold verified we suggested the creation of a mosaic of land use, where some sub-basins would be sacrificed and others keep preserved, as a mitigation action for the impacts caused by the urbanization process on the biodiversity of Neotropical urban streams.

S29.P.06

HIGHER LITTER SPECIES RICHNESS DOES NOT ENHANCES LITTER DECOMPOSITION

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Does biodiversity enhance ecosystem functioning? There is no established answer, majorly due to lack of appropriate manipulative experiments. We analyzed the effect of litter plant species richness and management type on litter decomposition, manipulating litter plant diversity. The study was carried out in nine study sites: three conventional coffee, three agroforestry coffee, and three forest systems. We used litter bag methodology, which were left to decompose in the field in intervals of 60, 120, 180 and 240 days. We set five treatment levels in relation to litter richness: one, two, four, eight and 16 plant species in the bags. To control for species composition effects, we randomized species identity among the 28 most common tree species in the agroecosystems. We estimated decomposition as the slope of binomial weight loss in each one of our 225 samples. We evaluated the effects of agricultural management and litter species richness with GLMM. Neither management nor plant species richness affected litter decomposition ($P > 0.28$). Previous studies, in forest habitat, detected increase in litter decomposition rates with litter species richness. Our results, however, showed that an eventual effect of litter richness is not independent of litter composition. Thus, if there were effects of litter richness on decomposition, they were masked by interactions within litter plant species. We expected that different managements would differ in decomposition biota and environmental traits, resulting in different litter decay rates. Our results showed that if there were differences among managements, they were not sufficient to alter litter decay rates. Litter plant species composition may be critical to access effects on ecosystem functioning. Some plant species may present particularly slow decay rates, hiding richness effects of the remaining litter species. Therefore we recommend that further studies should evaluate effects of litter composition on decay rates. Acknowledgment: FAPEMIG, CNPq.

S29.P.07

The use of biodegradable geotextile in degraded areas: assessment of the seeds and fiber characteristics for application

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Currently, among environmental concerns, the most prominent one is the degraded ecosystems restoration. The removal of the vegetation covering through human action makes some forest systems susceptible to erosion, and causes sedimentation of the watercourses and biodiversity loss. The biodegradable geotextile made of coir covered with a photo-degradable polypropylene mesh associated with sediment retainers is an available instrument in the control of bank erosion, and a promising bioengineering technique. The aim of this study was to select plant species, native to southeastern Brazil, which are suitable for the manufacture of biodegradable geotextile fertile (coir mesh with seeds), considering the ecological profile of the species as well as the characteristics of their seeds, and assess the deterioration of the fibers with time through tensile testing. The geotextiles made of coconut fibers were exposed to open environment during one year and fiber samples were collected at each three months. In terms of the mechanical parameters, the deterioration was considered as the decrease in the tensile strength. From the plant species that were studied, the ones that showed seeds with characteristics compatible for preparation of the biodegradable geotextile fertile were four leguminous herbaceous (*Arachis pintoii*, *Calopogonio mucunoides*, *Canavalia ensiformes* and *Centrosema pubescens*), and 126 tree species. Among the selected species, 77 were pioneers, 34 secondary and 15 climax seral stages. After the exposition period the coconut fibers presented tensile strength six times lower than non weathered fiber samples. The decrease in mechanical strength can indicate the deterioration of the vegetable fibers and inferred their ability to soil retention. This study indicates that water is the main environmental factor influencing the deterioration. Also, for an efficient application of vegetable fibers geotextiles, the rooting process of the seeds must be considered as a crucial aspect. Acknowledgments: Fapemig agency that promoted the project.

S29.P.08

Effect of Amazon Dark Earth on the composition, diversity and density of herbs, ferns, and palms on an amazonian forest in Bolivia

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Amazon Dark Earth (ADE) is the name given to patches of black soils found in the amazon region. These soils are associated to pre-columbian settlements, and are characterized by presence of pieces of ceramics and charcoal in the soil profile and by higher levels of phosphorous, Calcium and organic matter than other Amazonian soils around them. The effects of ADE on composition of palms and trees of secondary forest are recognized, but the effects on understory community are still unknown. Given that distribution of species of Marantaceae, Arecaceae and ferns are correlated with soil properties as texture and nutrients, we wanted to evaluate the effect of ADE on the composition, diversity and density of understory herbs, ferns and palms.

We carried out our research in twelve 27-ha plots in the tropical moist forest of La Chonta, northeast Bolivia. Based on soil color and presence of ceramics we identified the presence of ADE soils. Subsequently, 44 transects (150x4m) were established in ADE and in adjacent soils that did not have dark color to determine the presence and abundance of all species of Marantacea, Arecaceae, Costaceae, Heliconiaceae and ferns. Additionally we evaluated canopy tree and liana cover, and slope.

Using mixed models we found that ferns were more diverse in non-ADE soils than in ADE soils whereas composition and diversity of herbs and palms did not differ between soil types. Distribution of the common species in transects, such as *Bolbitis serratifolia* and *Heliconia episcopalis* seems to be driven by ADE and canopy openness. High resources in the soil had negative impact on fern diversity, but absence of response of herbs and palms could be associated with past species cultivation activities. Therefore, human's settlements in the Amazon could have a long-lasting legacy on the understory community by increasing soil fertility and species enrichment activities.

S29.P.09

Effects of human disturbance on seasonally dry tropical forests

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The aim of this work was to know how human disturbance affects plant community of the Caatinga ecosystem. We conducted this study in a Caatinga ecosystem (seasonally dry tropical forest) in Parnamirim, Brazil. We established 19 plots (20 m X 50 m) on places under different disturbance intensity (high, medium and low), measured as distance to Parnamirim and classified soil in Bruno non-calcic and Regossoil. We counted plant individuals (≥ 3 cm ground level) and registered the plant species they belong to (excluded species in the genus Croton). To test the effect of disturbance level and soil type on richness and diversity, we performed a Two-way ANOVA using species richness and Shannon-Weiner diversity index as response variables. To test if disturbance affects plant species composition, we performed an ANOSIM, using Euclidian distance as measure of dissimilarity. To know if the plant communities under high disturbance levels are a subset of the less disturbed communities, we performed a nestedness analysis (1000 aleatorizations) using NODF index. We found 46 species in 14 families. Species richness (1.6 times) and species diversity (1.3 times) were higher on low disturbed plots when compared to the highly disturbed plots. Soil type did not affect plant assemblages richness or diversity. The most disturbed plots had a different species composition if compared to low disturbance and to moderately disturbed, but it was not observed between low and moderately disturbed plots. Additionally, we found that the plant assemblage in Caatinga under different levels of disturbance were more nested than expected by chance. Our results suggest that human disturbance affects negatively the plant assemblages in Caatinga, and that the changes in the ecological filters are unfavorable to some life traits, which are eliminated from the community, leading impoverished disturbed plant species assemblages that are subsets of the less disturbed assemblages.

S29.P.10

Abundance and richness of tomato pollinators in different landscape contexts.

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Pollinators play an important role in agriculture because low fruit and seed productions may be due to insufficient pollination service. In this study, the frequency of pollinator visits to flowers was sampled in 14 tomato plantations located in different landscape contexts. These frequencies were recorded every 30 minutes between 9:00 to 13:00H, during three days in approximately 120 tomato plants of each plantation. Pollinator richness was estimated at the same time by capturing pollinators during their visits to other 120 tomato plants in the same plantations. Pan traps were also used for sampling pollinators in these plantations. Thirty traps of three different colors were distributed in those areas. Studied areas were located in the municipalities of Goianápolis and Nerópolis, Goiás State, Brazil. In total, 596 individuals of 46 species of bees were found. Seventeen species were found only in pan traps, 15 were captured exclusively in nets, and 14 species were found in both collection methods. About 295 bees were collected in pan traps and 300 in nets. The average rate of pollinator visits per flower per minute was approximately 0.66 bees, varying from 1.37 bees/min. in plantation inserted in area of high rate of vegetation cover to 0.27 bees/min. in area of low rate of vegetation cover. The most common bee species caught in the plantations were *Dialictus* sp., *Exomalopsis analis*, *Paratrigona lineate*, and *Augochloropsis* sp. The most abundant species *Dialictus* sp. does not vibrate the flowers and was not good polllinator. *Exomalopsis analis* was considered the most important pollinator of tomato flowers in the studied areas.

S29.P.11

Land use and the recovery of a Caatinga tropical dry forest: from plant species composition to assemblage functional diversity

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Human populations have altered tropical landscapes in such a way that mature tropical forests have disappeared, leaving behind a complex landscape consisting of agricultural fields, small fragments and regenerating forest patches. Slash-and-burn agriculture and cattle-raising have converted Caatinga vegetation (seasonally dry forest/sclerophyll vegetation in northeastern Brazil) into mosaics of regenerating forest stands. This offer opportunity to examine patterns of land-use and the forces conditioning forest regeneration, including the functional profile of regeneration forest patches. Here we address stands of Caatinga from regenerating to mature forest in order to examine the recovery of plant assemblage attributes and functional diversity as regeneration proceeds in human-modified landscape. The study was conducted in Serra Talhada, Pernambuco state-Brazil. Regeneration stands are 15-yr old following the abandonment of shifting-agriculture and cattle-raising/pastures. We have compared assemblage attributes as species richness and diversity and reproductive traits (36 categories of six traits: floral color, size, type, reward, pollination syndrome, and sexual system) between the three habitats: mature forest (control areas; N=14) and previous land-use: pastures (N=7) and agriculture (N=14) (disturbed areas). Functional diversity of reproductive traits was determined through diversity indices (H'; 1-D) for species richness and abundance. Mature forest plots had higher species richness and diversity compared with pasture and agriculture plots. The three habitats differed in 44.4% of the 36 reproductive categories, considering species richness, and 25% of the categories considering species abundance. Agriculture was the most impoverished habitat, without representatives of some categories of floral rewards and pollination syndromes. Functional diversity of reproductive traits of mature forest stands was higher than those of regeneration stands and significantly differed in almost all analyzed traits. We discuss the implications of land-use dynamic, particularly the length of fallow period, for forest regeneration and the role played by secondary forest patches regarding ecological services and biodiversity retention in human-modified landscapes.

S29.P.12

Patch attributes and the functional profile of tree assemblages in a fragmented landscape of Atlantic forest

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Understanding community assembly rules is a central topic in ecology, with critical implications for biodiversity conservation. Using a large vegetation dataset from seven rainforest fragments in the severely fragmented Brazilian Atlantic forest, we assessed the impact of patch area, shape complexity, connectivity and distance of sampling plots to the nearest forest edge on trait convergence (TCAP) and trait divergence assembly patterns (TDAP) in the metacommunity and tree functional diversity (FD) within communities. We considered four functional traits describing regeneration and dispersal strategies, and found that TCAP and TDAP were particularly notable when based on traits related to dispersal strategies (specifically to seed dispersal syndrome). The patch area was the main driver for TDAP related to dispersal syndrome and seed size. Patch size and shape complexity also drive TCAP toward specific spectrum of zoochorous high stratum species, respectively. Also, patch area, connectivity and edge distance were the main drivers impacting tree FD. Our results suggest that functional organization of tree assemblages may depend on a complex interplay of factors that alter seed dispersal, and those that impact vegetation structure. Whatever the biological mechanisms driving TCAP/TDAP and FD in this hyper-fragmented landscape, our results support the notion that (1) ecological filtering and biotic niche-based mechanisms are operating simultaneously, (2) many life-history traits are simultaneously linked to assembly forces, and (3) a wide set of patch attributes are influencing assembly patterns. Clear patterns of tree species assembly have emerged in the Serra Grande landscape and reinforce the notion that biodiversity persistence in human-modified landscapes is highly dependent on landscape spatial configuration, not just in terms of species requirements, but also in terms of community functional structure.

S29.P.13

Mesuring the rarity of tree species of Myrtaceae in Santa Catarina

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In Conservation biology, the concept of rarity provides an approximation of the vulnerability or the threat level of species confronted with environmental degradation. The main purpose of this study is to classify 5 tree species from *Myrtaceae* family sampled by the Floristic and Forest Inventory of Santa Catarina State in areas of Atlantic Rainforest. The collected data was analyzed from 202 sample units (SA) each of 0,4 ha, from trees with diameter at chest ≥ 10 cm and individuals in regeneration higher than 0,50 cm. The Rabinowitz methodology is applied to determine the rarity level using three variables: geographical distribution, habitat specificity and population size. The combination of these variables provides a rarity scale ranging from Type 1, less vulnerable, to Type 7, highly vulnerable. As regards to geographical distribution, longitudinal gradients were used, and the extensive ones occurred in three or more 0,5 degrees longitudinal bands. Habitat specificity was measured by the number of formations in which a specie was encountered. The population size was based on the number of individuals/SA, a specie being scarce with one individual/SA and abundant with two or more. Results point out that four species (80%) are at Type 6 (*Eugenia prasina*, *Eugenia subavenia*, *Marlierea racemosa* and *Myrcia tenuivenosa*), featuring strict geographical distribution and having selective habitat and high population density. *Eugenia sclerocalyx* was classified at Type 4, having a strict geographical distribution, but being a habitat generalist and having a high population density. *Eugenia prasina* and *Eugenia sclerocalyx* were reported uncommon in the State by other researchers and *Myrcia tenuivenosa* and *Eugenia subavenia* were classified as very rare. Type 6 species were categorized as priority species for conservation, these species are highly vulnerable and require urgent conservation and protection policies.

S29.P.14

Biometry, foliar and root anatomy of Aspilia grazielae Santos from mined and preserved areas of Urucum Complex, Corumbá, MS, Brasil

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The Urucum Complex, Corumbá/MS, inserted in the Pantanal, is the largest natural deposit of iron and manganese, and has been intensively mined for the last three decades. The phytofisionomy from top regions is peculiar and composed by herbaceous, woody and savanna species. An endemic shrub, *Aspilia grazielae* Santos (Asteraceae), is a common bioindicator of high levels of iron and manganese, and has a high potential of recovering disturbed mined areas. However, it is also widely distributed in basal non disturbed areas of the Urucum Complex. Thus, this work aimed to evaluate the biometry, foliar and root anatomy of *A. grazielae* from the top (disturbed) and basal (preserved) areas. For biometry (plant height, foliar length and width) 25 individuals were measured in each area. Leaves and roots (subterraneous system) were collected in April and August 2010, for anatomical study. All biometric measures were statistically different between the top and basal sampling. Generally, individuals from the basal and preserved areas showed twice the value of biometry from the top and disturbed areas. Anatomic analysis showed the presence of stomata in both foliar faces in all samples with no statistical difference in the amounts. The leaf anatomy of samples from disturbed area showed differences from those collected at the preserved areas – higher level of lignification of the cellular walls and the presence of a layer of palisade parenchyma in the mesophyll. The subterraneous system from both areas also showed differences - cells of secondary xylem have slightly lignified walls in samples of disturbed area. The subterraneous system of samples from both areas showed granules inside, which may be related to the tolerance of high levels of heavy metals. HM analysis of roots and leaves from both areas showed extremely high concentrations of iron and manganese, which indicates this species as a hyperaccumulator.

S29.P.15

Evaluation of seed bank favoring the natural regeneration of mined areas in Corumbá, Mato Grosso do Sul, Brasil

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The Urucum Complex (Corumbá/MS), inserted in Pantanal, is the biggest natural deposit of iron and manganese of Latin America. Hence, this region has been intensively mined for the last three decades, resulting in a large amount of disturbed lands that need to be restored. Environmental restoration is more efficient and less expense when are developed with the use of processes of natural regeneration. The restoration of mined areas, time and cost are higher due to the soil surface low condition for regeneration. The use of seed bank collected in the region preserved areas is a nucleation technique that favors the natural regeneration process. Thus, this work aimed to evaluate the potential for natural regeneration of the seed bank collected in two areas at the Urucum Complex: MA – Mined Area; and PA – Preserved Area. Seed bank samples were collected in May and August of 2010, at the Santa Cruz Mountain. After sampling, they were distributed in trays stored in the green house of the UFMS. After nine months of sun exposition, 402 emerged individuals were identified among 13 families, five genres and 13 species. Poaceae was the most abundant family (188 individuals at PA and 61 at MA), suggesting that the most abundant sucessional group was the pioneers, which are indicated for initial colonization of disturbed areas. Higher amount and diversity of seeds was found at PA samples. Therefore, it is suggested that seed banks from preserved areas closed to disturbed areas should be used to favor natural regeneration. This technique tends to provide cheaper costs and communities similar to the original system.

S29.P.16

SILVICULTURAL POTENTIAL FOR THE MANAGEMENT OF SECONDARY FORESTS IN THE BAJO CALIMA (BIOGEOGRAPHICAL COLOMBIAN CHOCO)

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The silvicultural potential of secondary forests in the Bajo Calima region which is part of the biogeographical Colombian Choco was evaluated. The research was carried out in two secondary forests with different levels of human intervention. The first was identified as a secondary forest in recovery (BSER) where clear-cutting occurred 30 years ago. The second forest with an age similar to the above described but which underwent recurrent logging processes was classified as a highly impacted secondary forest (BSMI). Both forests mentioned were compared with a small primary forest intervened (BSPI) and located in the same area and which retains similar structural features to those of the two forests before logging. Light conditions and the involvement of lianas with a potential pool of species used by local communities economically were evaluated. For this, a set of trees called outstanding desirable (DS) which corresponds to the best individuals in any size category seeling, latizal and trees, with conditions of high quality in canopy form and plant health was selected. General characteristics of the structure of the three forests as species richness were also evaluated. The results showed that currently evaluated forests are not able to support conventional logging; however, secondary forests are susceptible to silvicultural management as they have significant populations of individuals belonging to the group of species with high economic value traded in the region. Furthermore, due to the more homogeneous structure of these forests and the low species richness changes in their environment which enhance lighting conditions and forest growth were seen.

S29.P.17

Information About Invasive Alien Plants In Brazil: A Nonrestrictive Revision On Academic Works

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Compiling a database about invasive plant species in Brazil is an importante task, but due the size and heterogeneity of the country, it is not a simple endeavor. A recent revision focused only in high-impact journals and the unique open-access database for Brazil lists many species lacking scientific accessment of their invasive status. To reach a broad spectrum of academic works we revised all papers published until March 2012 in journals, but also in undergraduate monographs, thesis, dissertations and abstracts from meetings in ecology, botany and related fields. All studies that had in the title the espression “invasive species” or “biological invasion” or that referred to it in the keywords were included. A total of 124 published works were found, being 51.6% in scientific journals, 34.7% in abstracts of scientific meetings, 13.7% other academic works (undergraduate, master and PhD degrees). 33.8% of the works focused protected areas and 45.9% had quantitative sampling, but only 8.8% had sampled more than one time. 35.5% of papers deals with Atlantic Forest, 18.5% with Cerrado, 17.8% with Caatinga, 8.8% with grasslands and 12.9% not identified target ecosystem. 177 species from 57 families were listed, under five enlisting criteria: 1. Plant invasive potential (IP) based in invading behavior noticed in other countries; 2. IP based on species ecophysiological characteristics; 3. IP based on observations of other researchers and from open access, colaborative database; 4. Qualitative studies, in a single location or in several locations (replicates) and 5. Quantitative studies, in a single time or with time series monitoring. Of all species, 69.5% lacks qualitative or quantitative research and thus their invasive status should be considered carefully. According to this rewiew, for only 54 species invasive alien status in Brazil is scientifically supported. Real figures could be a lot larger, pointing to the need for increase research efforts.

Key-words: Atlantic forest, Cerrado, Caatinga, Invasive potential.

S29.P.18

Human disturbances and the proliferation of plant diseases: Part II

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In general terms a “disease” includes a series of micro-organisms (agents) that disturb plant metabolism (e.g., growth) causing even its death. Infectious agents could be fungi, nematodes, viruses, bacteria or even other flowering plants. Fungi are however, the major causal agents of plant diseases and jointly with insects comprise the major threat to wild and cultivated plant species worldwide. Fungal pathogens drive many ecological and evolutionary processes in natural ecosystems. However, most information concerning plant-pathogen interactions in natural ecosystems comes from temperate regions (e.g., forests and grasslands) and limited attention has been given to this important biotic interaction in tropical natural systems as compared to that devoted to fungal diseases in tropical agriculture. The information gathered for tropical forests illustrates the prevalence of fungal diseases in the understory and canopy vegetation affecting many plant species at all stages of their life cycles. The most common are foliar pathogens. In this talk I describe several types of human disturbances (i.e., forest fragmentation, edge creation, selective logging, road openings and secondary succession) in three Neotropical sites i.e., (Chajul, Los Tuxtlas and Manaus), shown to affect the interaction of plants with their foliar pathogens in natural systems. For all study cases presented, human disturbance increased the incidence and levels of pathogen damage on the foliage. Firstly, leaf diseases in tropical plants are described; secondly the physical and biological factors involved in disease development and transmission; thirdly, the impact of anthropogenic disturbance in facilitating leaf fungal infection; then the potential consequences of disease spread, and finally, the implications of such disease induced changes in tropical rain forests function and conservation.

S29.P.19

Impact of human pressure on cacti populations from Brazilian Caatinga

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Species exploitation and land use changes are pointed as the main threats to cacti populations worldwide. In Caatinga vegetation, Cactaceae is one of the most important plant families in terms of species richness, as well as food resource for fauna and for human population. However, the impact of anthropogenic disturbances on cacti populations is poorly known. Here, we examine how human disturbances have affected the size of eight cacti populations: *Arrojadoa rhodantha*, *Cereus jamacaru* subsp. *jamacaru*, *Harrisia adscendens*, *Pilosocereus gounellei* subsp. *gounellei*, *Pilosocereus pachycladus* subsp. *pernambucoensis*, *Melocactus zehntneri*, *Tacinga inamoena* and *Tacinga palmadora*. The survey was conducted in an area of Caatinga located at Pernambuco state, in 30 plots of 50 m x 20 m, where all cacti individuals were recorded and the distance to urban center was measured as a indicator of human pressure. Four of eight populations were influenced by the distance to urban center. *Pilosocereus gounellei* subsp. *gounellei* and *M. zehntneri* were the most abundant species (644 and 484 individuals, respectively) and their populations were larger when closer to urban center. On the other hand, *A. rhodantha* and *P. pachycladus* subsp. *pernambucensis* (180 and 69) showed reduced populations when near to urban center. The populations of *C. jamacaru*, *T. inamoena* and *T. palmadora* (90, 254 and 228) were not influenced by the disturbance indicator. *Harrisia adscendens* was the less abundant species (13), occurring in only four plots, and was not possible analyze its response to disturbance. Our results indicate that the responses of studied cacti seems to be species-specific, some of them showed to be vulnerable and others persistent or opportunist, displaying different answers to habitat changes.

S29.P.20

Pre-Colombian human transformation of forest landscapes of the Purus-Madeira interfluve, Central Amazonia

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During the Holocene, Native Amazonian populations expanded to several millions and developed efficient systems for managing forest resources, often creating oligarchic forests dominated by useful trees, such as the well-known Brazil nut stands. The densest human populations were located along the major whitewater rivers. However, the scale and spatial distribution of forest modification is still unknown. Recent studies propose that human impact away from the rivers was minimal, which suggests that interfluves were probably relatively undisturbed in the past. Our study assessed the variations in the degree of past human manipulation in forests at six sites along the Purus-Madeira interfluve as a function of the distance from the main and secondary rivers. In all sites we inventoried trees with DBH ≥ 10 cm in two 1 ha plots. The shortest distance in kilometers from each plot to the rivers was calculated. To quantify forest manipulation, we measured the relative richness, abundance and basal area of useful trees, especially fruit trees. We tested the relationships between these parameters of forest manipulation and the plot's distance to the rivers. We found strong negative exponential relationships between forest manipulation and the distance to main rivers. Plots that were less than 20 km from a main river had 25-40% useful tree species, plots with distances between 20-40 km had 15-25% useful trees, while plots greater than 40 km had less than 15%. These results strongly suggest that past forest manipulation by humans was not limited to the pre-Columbian settlements at the edges of the main rivers, but extended over interfluvial areas considered to be primary forest today. The sustainable use and conservation of Amazonian forest resources will be most effective if it considers the degree of past landscape domestication, as human-modified landscapes concentrate useful plants for human use and management today.

S29.P.21

Anthropogenic disturbance do not influence seed protection in nests of a keystone mutualist ant in the Caatinga vegetation

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Ants are frequently described as important seed dispersers in semiarid ecosystems, where they not only remove diaspores from parental spots and discard intact seeds on suitable sites for germination, but also protect post-dispersed seeds against predators. But these benefits are strictly related to ant species involved in the interaction. The best services are provided by the keystone mutualists, which are those species whose disperse seeds farther and faster and deposit them less grouped in nest areas than the other species. However, anthropogenic disturbances (e.g. logging, fire, and conversion of natural areas in plantations and pastures) may affect the abundance and behavior of these mutualist ants. The aim of this study was to investigate the role of *Dinoponera quadriceps* Santschi (Hymenoptera: Formicidae) as a keystone seed-disperser in the Caatinga, protecting seeds from predators, and to verify the influence of human disturbances in this ant-plant interactions. The work was done in 24 0.1 ha plots distributed along an anthropogenic disturbance gradient combining several disturbance metrics (i.e. distances to the nearest road, nearest rural village and nearest urban center). All nests in the plots were quantified and the seeds in the nest refuse piles and in a control area (1 m from refuse piles) were collected to evaluate seed predation. We found 95 nests, with no difference in nests number through the disturbance gradient. There were 78 types of seeds, 12 were true myrmecochorous shrubs and trees. Nest areas showed 1,5 times lower seed predation which indicates that *D. quadriceps* protects seeds against predation acting as a keystone seed-disperser in Caatinga. However, seed predation was not influenced by anthropogenic disturbances. These results indicates that the ant-plant interaction is not affected by disturbance and that this nests could be acting as sites of diversity maintenance preserving the seed bank even in disturbed areas.

S29.P.22

Effects of anthropogenic disturbances on ant species and functional composition in Caatinga vegetation

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Anthropogenic activities are the main threat to natural ecosystems. For example, areas facing human disturbances exhibit plant and animal communities with reduced number of species, composed frequently by less specialized functional groups. In this study we investigated the influence of the human disturbances on ant communities and functional group composition in Caatinga vegetation, a tropical seasonally dry forest. We used 30 0.1-ha plots in different areas of Caatinga in Pernambuco, NE Brazil. We measured the distance from plots to the nearest human settlement using satellite images, and used it as a proxy of human disturbance. In each plot, we set six pitfall traps (10 m intervals) and 24 tuna baits (10 m intervals) on the soil and vegetation. The traps were active for 48 hours and tuna baits for 90 minutes. We found 51 ant species belonging to 21 ant genera and seven subfamilies. Human disturbance did not affect the richness of species and functional groups. However, human disturbance negatively affected the abundance of Cryptic Species and Subordinate Camponotini functional groups. The apparent resistance of Caatinga myrmecofauna to human-generated disturbances may be due to the very restrictive climate conditions of this ecosystem which leads to an ant fauna frequently composed by species with generalist habits. However, the susceptibility to human disturbances of Cryptic Species and Subordinate Camponotini may indicate a higher dependence of these groups to soil leaf litter and vegetation structure, respectively. It suggests that human-originated environmental alterations may reduce the abundance of some ant functional groups simplifying the structure of ant communities in this tropical seasonally dry forest.

S29.P.23

Anthropogenic actions decrease amphibian populations

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Amphibians are good bioindicators of environmental quality, since their skin permeability and water dependence make they sensible to environmental change. Anthropogenic actions are one main cause of amphibian populations decline around the world. Factors involved in this declines include habitat loss, climate change, chemical contaminants, and diseases. These last factors are usually caused by pollution from sewage effluents, and often cause death, decrease of growth rates, developmental abnormalities, and decrease of reproductive success. Understanding the extent of the problem requires an understanding of how local factors affect the dynamics of local populations. We evaluated the effects of lipopolysaccharide (LPS) from *Escherichia coli*, a compound widely found in environments polluted by effluents from sewage, and that has been reported to directly influence the reproductive output of anurans. We used 30 adult males of *Eupemphix nattereri* and analyzed the amount of germinative cells 2 hours (LPS 2h) and 24 hours (LPS 24h) after LPS administration. We found that LPS changed testicle histology, and compromised the production of germinative cells. Spermatogonia, spermatocytes, and spermatozoa decreased after 24 hours of administration. Spermatozoa decreased by 30% after 24hours of LPS administration, demonstrating that this compound has a profound action on species reproduction. However, some frog species have pigment cells in the testicle that protect germ cells from LPS, due to the bactericidal role of melanin. Therefore, sewage effluents may severely decrease anurans' fertility by decreasing the productions of germinative cells and directly influencing the reproductive output of species. We stress that this substance could contribute to amphibian species decrease by negatively influencing species fitness.

S29.P.24

Ecological, evolutionary and anthropogenic determinants of the distribution of threatened amphibians in the Western Hemisphere ecoregions

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The current rate of biodiversity loss challenge ecologists to develop predictive models capable to summarize important eco-evolutionary processes and, most importantly, to tailor conservation policies that can be readily assimilated by policy makers. In the past decades, the worldwide decline of amphibian populations has become one of the main priorities in the conservation agenda. Here, we propose an integrative approach to assess the ecological, evolutionary and anthropogenic determinants of threatened amphibian species distribution in the western hemisphere. We evaluate how climate, land use, phylogenetic structure, species richness and endemism influence the distribution of threatened amphibians (according to the IUCN Red List) throughout American ecoregions using path analysis. We analyzed three different scenarios: (1) the urgent scenario, containing only species critically endangered and extinct in the wild, (2) the moderate scenario containing endangered species and those at higher risk categories and (3) the most inclusive scenario, which gathered all vulnerable species and those at higher categories. In all scenarios we found a significant influence of species richness, endemism and the cover of villages in each ecoregion. Climate and phylogenetic structure were important drivers of amphibian spatial distribution only in the most inclusive scenario. While much attention has been paid to effects of climate change on amphibian decline, we found that land-use changes have a strong influence in the distribution of species at higher risk. The results highlight that 1) man-made land transformation is a critical factor underlying amphibian extinction risk and geographical distribution, and 2) the effectiveness of land-use policies would benefit from incorporating biogeographical features into ecological models.

S29.P.25

Human-managed savanna woodlands can contribute to biodiversity conservation and human well-being in the Western Ghats biodiversity hotspot, India

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Existing protected areas are insufficient for conserving remaining tropical biodiversity, and there is limited scope for creating new protected areas. Understanding the capacity for human-managed landscapes to contribute to the maintenance of biodiversity is therefore critical to achieving conservation objectives while meeting human needs. Non-timber forest product (NTFP) harvest is often believed to have a high compatibility with biodiversity conservation if harvest is sustainable at the plant population level. However, this assumption has rarely been tested. In this study, we investigate the degree to which management for harvest of an NTFP (leaves of mountain date palm, *Phoenix loureiri*) is compatible with maintenance of native plant diversity in savanna woodlands of the Western Ghats biodiversity hotspot, India. As is true for many NTFP harvested in the tropics, mountain date palms are managed with fire and are harvested from areas grazed by both wild animals and livestock. To assess the potential for sustainable leaf harvest, we develop integral projection models of mountain date palm population dynamics under varying harvest and grazing intensities and times since fire based on 14 palm populations monitored from 2009-2011. In addition, we compare the taxonomic and functional diversity of the plant communities surrounding the focal palm populations, which represent different histories of harvest, livestock grazing and fire. Mountain date palm populations exhibit resilience to fire, grazing and leaf harvest, suggesting a high potential for sustainable harvest. Mountain date palm leaf harvest appears to be compatible with the maintenance of a high degree of plant diversity. However, the use of fire to manage for mountain date palm harvest may reduce tree cover and diversity while promoting understory forb diversity. These findings suggest that, overall, human-managed savanna woodlands in the Western Ghats are valuable for their capacity to both provide benefits to local communities and contribute to biodiversity conservation.

S30.OC.01

Changing drivers of deforestation: what it means for conservation

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While tropical forests continue to fall at a rate of more than 10 million acres a year, the dynamics of deforestation are changing. Forest conversion and degradation are increasingly driven by a limited number of companies meeting global demand for commodities rather than hundreds of millions of poor farmers simply trying to put food on the table for their families. In other words, deforestation is increasingly driven by profit (urban consumption and trade), rather than poverty (subsistence activities). This shift has critical implications for stopping deforestation: humanity's success in transforming markets will determine the fate of tropical forests.

S30.OC.02

Forest Frontiers in the Andean Amazon

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A survey of the geographic deforestation hotspots in Bolivia, Peru, Ecuador and Colombia is combined with a review of the economic and social characteristics of individual landscapes and the policies and markets that mediate land use in the region. Industrial agriculture, global commodities, illicit coca, artisanal gold mining, internal migration, smallholder settlements and foreign investment are evaluated in the context of state policies to promote infrastructure development, administrative decentralization, indigenous rights and nascent REDD+ schemes, as well as market phenomena such as biofuel mandates, free trade treaties and initiatives to improve the sustainability of corporate supply chains.

S30.OC.03

Belo Monte and the controversy over Amazonian hydroelectric dams as sources of greenhouse gases

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Tropical dams emit significant amounts of greenhouse gases despite the image of "clean energy" that is strongly promoted by the hydroelectric industry. In Amazonia, dams often emit more than generating the same energy from fossil fuels for many years. First, the trees killed by flooding of the forest frequently project above of the surface of the water and release carbon dioxide (CO_2) as they decay. This emission constitutes a net contribution to the greenhouse effect. Much of the plant matter that decomposes in the reservoir does not release its carbon in the form of CO_2, but rather as methane (CH_4) because the water at the bottom of the reservoir has virtually no oxygen, and the oxygen necessary to form CO_2 is therefore not available. This vegetation includes aquatic plants that grow in the reservoir and the grasses and herbaceous weeds that grow in the drawdown zone around the edges of the reservoir (the area that is exposed when the water level is lowered and is flooded when the reservoir fills again). Methane released as the vegetation decays underwater has a much greater impact on global warming than would release of the carbon as CO_2 (25 times more per ton of gas according to the 2007 IPCC). The main pathway for emission of the methane is the water that passes through the turbines and the spillways. The Belo Monte Dam, now under construction on the Xingu River, would have a relatively small reservoir (516 km^2), but the Babaquara or Altamira Dam that most independent observers expect to be built upstream of Belo Monte to regulate the river flow would flood 6140 km^2. With a 23-m vertical oscillation in water level it would repeatedly expose a drawdown zone of 3580 km^2, thus creating an enormous "methane factory."

S30.OC.04

The Gold Mining Boom in the Western Amazon

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Informal gold mining has exploded in the western Amazon, with a hotspot of activity centered in the southern Peruvian Amazon lowlands and sub-montane region. Estimates of gold mining extent have been extremely rough, but here I provide highly precise mining area data derived from the CLASlite deforestation and forest degradation mapping system. I then provide new information on local-scale effects of mining on forest structure and composition, derived from the Carnegie Airborne Observatory (CAO). The extent and impacts of gold mining are a yet underappreciated force of major ecological change in Amazonia.

S30.OC.05

Characterization and Quantification of deforestation risk model uncertainty: a case of the Brazilian Amazon

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Deforestation risk models have been proposed to predict long-term (i.e., > 25) future scenarios for the Brazilian Amazon region. These models have served well to call the attention of policy makers, conservationist and activist groups, NGOs and general society to threats to forests and their biodiversity, carbon stocks and ecosystem services. Additionally, applications for establishing reference level baselines for financial payments for Reducing Emissions from Deforestation and Forest Degradation (REDD+), using deforestation model predictions, have recently gained importance. However, the uncertainty of deforestation models for the Amazon region have not been characterized and quantified and this could limit their applications to prevent deforestation and the implementation of REDD+. Here, we present an assessment of uncertainty of our deforestation risk model developed to predict short-term deforestation (i.e., within one year) in the Brazilian Amazon for the year 2011. To do that, actual deforestation detected with Prodes forest monitoring system in that year was compared with the model predictions. We found out that the annual deforestation rate of the model for 2011 was 17% higher relative to Prodes, and that 81% of the actual forest clearings happened within 5km from the locations predicted. The model matched 20% of the deforestation detected by Prodes at the exact location (i.e., within 1km which is the model resolution). The assessment at the municipality level revealed good correlation between model and Prodes (i.e, r=0.82), and lower correlations for protected areas (i.e., r=0.67-0.72 depending on the area category). The worse performance was to predict deforestation at rural settlements level (r=0.62). This assessment also shed light on future model improvements to reduce uncertainty such as including distance to hydroelectric dams as a new predictor variable. Moreover, quantifying the model uncertainty brought more credibility to its use in government actions to prevent deforestation in Pará state.

S30.OC.06

Predicting regional scale impacts of deforestation patterns originating from contrasting development scenarios in the Brazilian Amazon

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Unprecedented tropical forest destruction demands the development of innovative forest conservation strategies. Recently, debates on new strategies for reducing forest loss have been proposed that target major corporations and trade groups. Here, we argue that to be socially, economically and politically sustainable forest conservation strategies must not neglect small (<441 ha) rural properties that account for over 26Mha of the Brazilian Amazon. To understand the socio-economic drivers of deforestation we compiled historic and current data including: annual deforestation (Programa de Cálculo do Desflorestamento da Amazônia-PRODES), livestock production, temporary and permanent crops, and population (Instituto Brasileiro de Geografia e Estatística-IBGE). We also predicted rates of forest and vertebrate losses in the Legal Amazon based on a long-term study (June 2001-July 2009). Our field data was based on 294 interviews conducted with local landowners and a survey of 300 rural properties. Over the past decade, the Legal Amazonian rural population is stable or increasing, accounting for over 7M people. Contrasting deforestation patterns originating from varying sized private properties resulted in differences in forest retention with small rural properties retaining a lower proportion of forest (32.6%, SD=26.6) when compared with large properties (59.1%, SD=25.6). Deforestation in small properties produced a landscape structure composed of small forest remnants lacking connectivity that failed to sustain the majority of forest interior vertebrates. Although small properties represent a smaller proportion of land area compared with large properties, the degradation caused by deforestation patterns in small properties means they represent a disproportionately large impact on Amazon forest conservation. As subsidized agricultural resettlements are also increasing, small rural properties are likely to remain important drivers of Amazonian deforestation. In order to improve the sustainability of rural livelihoods and conservation of the Amazon forest we suggest that the challenges of including small properties into incentive mechanisms (REDD/PES) must be addressed.

S30.OC.07

Global Trade Could Increase and Complicate GHG Benefits from Cattle Ranching Intensification in Brazil

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Reducing the pressure of agriculture on forests is at the heart of debates over the future of biofuels and since 2009 it has been an explicit focus of negotiations on Reducing Emissions for Deforestation and Forest Degradation. One proposal, known as land sparing, aims to boost output on agricultural lands and/or steer agricultural expansion onto low carbon content lands to free land for forests and other productive uses. I present a framework to analyze land sparing and I highlight its promises and challenges using a simulation case study of Brazilian cattle ranching intensification. Under land sparing, agricultural yield increases *cause* a decrease in agricultural land *relative* to the area that *would have existed* without the yield increase. Because land sparing is market-mediated, the geography of land use and climate impacts from land sparing depends upon the geography of the markets for the products of the targeted agricultural systems. I illustrate this principle using a simulation depicting global land use and greenhouse gas emissions with and without policies targeting land sparing through the intensification of cattle ranching systems in Brazil. The simulation shows that global trade could offshore the land sparing from Brazilian cattle intensification. In the simulation, increases in low-cost Brazilian cattle reduce the area of profitable cattle around the globe and this delivers land sparing. Were this GHG mitigation offshoring to occur, it could deliver not only GHG benefits, but also political complications stemming from these trade effects. I conclude by exploring these politics, and also by discussing regulatory, political and behavioral assumptions to which these results are sensitive.

S30.OC.08

Addressing the Drivers of Tropical Deforestation: A Policy Perspective

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Tropical deforestation is a major threat to biodiversity, indigenous communities, and contributes around 15% of global carbon emissions. Reducing deforestation is essential to solving the major environmental and social problems we face today. Beginning in the early 1990s, large-scale commodity production, namely palm oil, soybeans, cattle, and wood products, began to play a major role in deforestation. These commodities are part of a global market and the demand for them is also global. Tropical deforestation at a global scale cannot be halted without addressing these demand side activities that drive it. Further, the global economic nature of this demand means that policies to address tropical deforestation must exist on a number of scales and across many sectors. Here we present an examination of the major business, national, and international policies currently being devised to address the drivers of tropical deforestation, including:

Policies established by the various commodity roundtables (palm oil, soy, biofuels, beef, and leather).

Policies and practices developed by businesses, which go beyond the roundtables.

Deforestation moratoria established by businesses and governments at the national level, including the soy and beef moratoria in Brazil and the deforestation moratorium in Indonesia.

Initial international framework being developed by the UNFCCC to address the drivers of tropical deforestation.

S30.OC.09

Committed carbon emissions and deforestation from oil palm plantation expansion in West Kalimantan, Indonesia

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Industrial agricultural plantations are a rapidly increasing, yet largely unmeasured, source of tropical land cover change. Here, we evaluate impacts of oil palm (*Elaeis guineensis*) plantation development on land cover, carbon flux, and agrarian community lands in West Kalimantan, Indonesian Borneo. With a spatially-explicit land change/carbon bookkeeping model, parameterized using high-resolution satellite timeseries and informed by socio-economic surveys, we assess previous and project future plantation expansion under five scenarios. While fire was the primary proximate cause of 1989-2008 deforestation (93%) and net carbon emissions (69%), by 2007-2008, oil palm directly caused 27% of total and 40% of peatland deforestation. Plantation land sources exhibited distinctive temporal dynamics, comprising 81% forests on mineral soils (1994-2001), shifting to 69% peatlands (2008-2011). Plantation leases reveal vast development potential. In 2008, leases spanned ~65% of the region, including 62% on peatlands and 59% of community-managed lands, yet <10% of lease area was planted. Projecting Business-As-Usual (BAU), by 2020 ~40% of regional and 35% of community lands are cleared for oil palm, generating 26% of net carbon emissions. Intact forest cover declines to 4%, and the proportion of emissions sourced from peatlands increases 38%. Prohibiting intact and logged forest and peatland conversion to oil palm reduces emissions only 4% below BAU, because of continued uncontrolled fire. Protecting logged forests achieves greater carbon emissions reductions (21%) than protecting intact forests alone (9%), and is critical for mitigating carbon emissions. Extensive allocated leases constrain land management options, requiring tradeoffs among oil palm production, carbon emissions mitigation, and maintaining community landholdings.

S30.OC.10

Pathways Towards a Sustainable Loreto, Peru

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The Department of Loreto, Peru is within the richest zone of biodiversity in the Amazon, and potentially the world. It is also very high in biomass, which has implications for REDD+ policies, and is home to a wide variety of indigenous peoples, including uncontacted groups. However, major plans for infrastructure development and extraction of natural resources, combined with relatively weak governance over much of the region, threaten to undermine the future of this ecological treasure. The Sustainable Loreto project aims to understand the potential future of the region and to support efforts to improve its conservation, with an ultimate goal being Strategic Environmental Assessments for key sectors. We summarize the current situation of the region and the major proposals for infrastructure and other economic development. Much of the region is still largely intact, and deforestation is relatively low, although illegal logging of valuable species is a widespread concern. Potential drivers of future impacts include extensive oil development, a railway and electrical transmission line to Iquitos, and hydroelectric dams. Modeling potential effects of these threats on rates of deforestation, as well as other ecological and social impacts, will be vital to guiding the region toward a sustainable path for the future.

S30.OC.12

Challenges of Pulp and Paper Industry Expansion in Indonesia's Emerging Carbon Economy

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In 2009, the Government of Indonesia pledged to reduce the country's greenhouse gas emissions by 26 percent by 2020 – and up to 41 percent with international assistance. Few factors will affect Indonesia's ability to meet its emission reduction targets as much as the development pathway taken by the nation's pulp and paper industry over the coming decade. Indonesian pulp producers control millions of hectares of carbon-rich forests and peatlands, either directly through their forestry companies or indirectly through oil palm affiliates. The extent and pace at which these areas are converted will be shaped heavily by the fiber supply strategies of Indonesia's existing kraft pulp mills, which collectively consume approximately 30 million tonnes of wood annually. As significantly, Indonesia's leading pulp and paper producers have recently initiated a new phase of capacity expansion projects, both in Indonesia and China, which could substantially increase the industry's structural pressures on land, forests, and carbon resources. This paper examines the current development trajectory of Indonesia's pulp and paper industry, and assess the challenges it poses for the nation's emerging carbon economy. It identifies underlying risk factors, governance challenges, hidden costs and tradeoffs, and anticipated impacts on forests, carbon emissions, rural communities, and national economic development.

S30.P.01

Multi-temporal analysis of land-cover change between 1956 and 2006 in the Brazilian Atlantic Forest: A case study of the Biguaçu River catchment, Santa Catarina

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Being one of the most biodiverse and populated biome of the planet, the Atlantic Forest Hotspot has constantly been under pressure as forests were replaced by crops, pastures and real-estate. Located in the Atlantic coast of Santa Catarina in Brazil, the 397 km^2 Biguaçu River catchment was originally almost entirely covered with dense ombrophilous Atlantic Forest. Forests inventory of 2010 revealed alterations of forested cover and species composition as compared to 1978 inventory. Little is known about when and how these transformations occurred. Land-cover monitoring was conducted by mapping 36km^2 (1956 aerial photo) part of the lowland floodplain of the Biguaçu river (by visual classification), then using supervised classification (Regions of Interest) of the whole catchment (397km^2) (Landsat3 1979 Satellite image ; 2006 FATMA land-cover map). Georeferenced land-cover change maps were realized by multi-class intersects of previous maps. Four sampled sites from the forest inventory allowed us to determine the structure and species composition change since 1956. Nowadays forests occupy 63,76% of the Biguaçu River catchment, but from 1979, forest cover decreased of 1,37% (686ha). The main reason for these changes is deforestation for croplands and pastures, mostly located on lowland floodplain. IFFSC inventory found forests are at a medium stage of regeneration and an absence of full grown climatic valuable tree species due to selective cutting. This paper pointed out the importance of mapping with a greater time lap range coupled to field work data to monitor changes of an area. Occupying 31,85%, although forest cover decreased of 2,95% in the lowland floodplain between 1956 and 2006, it increased of 1,84% between 1956 and 1979. Reforested areas, largely located on higher grounds, are low in species biodiversity and composed of young trees. Those changes in the basin, largely spatial, are directly linked with topography and human activities.

S30.P.02

THE IMPLICATIONS OF DEFORESTATION TO THE POPULATION OF SUMATRAN TIGER IN BUKIT BARISAN SELATAN NATIONAL PARK, SUMATRA, INDONESIA

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Bukit Barisan Selatan National Park (BBSNP), the third-largest protected area (3568 km^2) in Sumatra, has been identified as a high priority tiger conservation area (TCU I = Tiger Conservation Unit I) for tropical moist evergreen forest in Southeast Asia and also declared as a World Heritage site by UNESCO (decision 28COM 14B.5). Sumatran tigers have been classified as Critically Endangered (Appendix I CITES) and persist in isolated population throughout Sumatra included BBSNP. However, much of the forest cover in BBSNP has been cleared dramatically and it is become a great threat on the population of Sumatran tigers. Remotely-sensed data sets were linked with wildlife survey using camera traps to examine deforestation and its implications to the population of Sumatran tigers. The study showed that the average rates of forest loss in BBSNP were 18.76 km^2 per year, representing a 7% loss from 1998 to 2006. The number of tigers declined from 57 tigers in 2000 to 22 tigers in 2006, and tiger density decrease from 2.25 tigers/100km^2 in 2000 to 1.16 tiger/100km^2 in 2006. Deforestation has implications in tiger presence and tiger preference to the forest. Tiger presence is more frequent in interior forest than deforested area. They are tend avoid deforested edges ($r = 0.72$) and prefer use interior forest. Tigers preferentially use interior forest area as avoidance of human activities that reduce forest cover along the deforested edge. However, tiger are also found in non-active deforested area for hunting. In short, tiger use interior forest or primary forest as their territory area and use peripheral forests (secondary forest), shrubs, and non-active deforested areas as hunting location.

S31.OC.01

Quantifying landscape degradation at a deforestation frontier in the Brazilian Amazon

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Forest landscape degradation from logging, forest fires and fragmentation can result in drastic losses of carbon and biodiversity and represents a major threat to the integrity of tropical forests worldwide. In the Amazon these anthropogenic pressures have already impacted an area larger than the total area of cleared land. Yet forest degradation and past deforestation trajectories are rarely accounted for in designing forest legislation, management and financial incentive schemes. Moreover, there is still a lack of clarity on optimal approaches to classifying and quantifying forest degradation. Recent developments in remote sensing, together with multi-decadal time-series of satellite images, provide opportunities for cost-effective, large-scale assessments of historical deforestation and forest degradation trajectories. Here we present a nested (site, catchment and region) assessment of deforestation and the frequency, timing and extent of pixel-scale anthropogenic degradation events during1988-2010 across two large (c. 1.5 million ha) study regions in the Brazilian Amazon (Paragominas and Santarém). We also use detailed field data to validate remote-sensing based estimates of forest degradation. We demonstrate that while deforestation trajectories at the catchment scale can help to explain spatial patterns of degradation, landscapes with similar levels of present-day forest cover still exhibit marked variability in forest condition and degradation profiles. Moreover, remote assessments of forest condition using only contemporary satellite images perform poorly in capturing the spatial heterogeneities in the frequency and timing of historical degradation events. We present new indices of forest degradation based on accumulated information regarding the extent and timing of historical impacts. These indices can inform a revised classification of forest degradation as well as a set of testable hypotheses concerning the loss of forest carbon stocks and biodiversity. These results contribute to integrate avoided degradation strategies into REDD+ programs, and to municipality scale ecological-economic zoning and conservation efforts in private lands.

S31.OC.02

The end of slash-and-burn by Amazonian smallholders?

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Tropical forest fires are increasingly frequent and contribute to rising global carbon emissions, threaten biodiversity and harm human health and economies. Many forest fires are caused by escaped agricultural fires in which burning is used as a labour-saving method of clearing vegetation and enhancing soil fertility without chemical inputs. In some areas increasing pressure on land has also led to shortened fallow periods and associated declines in agricultural productivity. Slash-and-burn agriculture therefore appears incompatible with conservation and sustainable development, particularly in light of climate change and increasingly severe dry seasons that increase forest flammability. To explore the potential for a transition from slash-and-burn to fire-free farming we examined spatial and temporal patterns of agricultural fire-use in 36 landscapes in eastern Amazonia. We conducted a questionnaire survey of 497 farms ranging from small family plots to large cattle ranches and mechanized arable farms, and conducted interviews with key stakeholders in the agricultural sector. Fire-use was commonplace in most landscapes and fire management practices were generally inadequate due to insufficient resources, training and governmental intervention. Agricultural fires frequently escaped into adjacent forest and farm-forest mosaics were often threatened by fires from neighbouring farms. However, in landscapes that included large-scale capitalized farms, smallholders took advantage of available agricultural machinery and many had abandoned slash-and-burn in favour of mechanization. Smallholders in more remote areas were dependant on the unreliable provision of tractors from public agencies and consequently maintained a reliance on slash-and-burn. We also used interviews and remote sensing data to test whether a transition to mechanized land preparation reduced fire occurrence in surrounding forest. Finally, we examine the barriers to fire-free agriculture in Amazonia and consider the relative merits (and pitfalls) of available policy options to hasten this agricultural transition.

S31.OC.03

Temporal patterns of road network development in the Brazilian Amazon

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The Brazilian Amazon is a globally important ecosystem that is undergoing rapid development and land use change. Roads are a key spatial determinant of land use conversion and strongly influence the rates and patterns of habitat loss, and represent a key component of models that attempt to predict the spatio-temporal patterns of Amazonian land use change and the consequences of such changes. However, the spatio-temporal patterns of road network development are poorly understood and seldom quantified. Here, we manually digitised satellite imagery at multiple temporal and spatial scales across the Brazilian Amazon to quantify and model the rate at which road networks are proliferating. We found that the road network grew by almost 17 000 km per year between 2004 and 2007. There was large spatial variation in road network density, with some municipalities having road densities as high as 0.5 km/km^2, and road network growth rates were highest in municipalities with an intermediate road network density. Simulations indicated that road network development within municipalities follows a logistic growth pattern through time, with most of the development occurring within a 38 year time period. This time period is similar to those of other boom and bust development dynamics observed in the Brazilian Amazon. Understanding the temporal patterns of road development will aid the development of better predictive land-use change models for the Amazon.

S31.OC.04

The influence of supply chain configurations on soybean profitability in the Brazilian Amazon: a comparative case study of Santarém, Pará and Sorriso, Mato Grosso

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This study examines soybean production along the Santarém-Cuiaba highway in the Brazilian Amazon using a comparative case study of Santarém, Pará and Sorriso, Mato Grosso. In particular, we focus on understanding how supply chain configurations affect the profitability of soy production using data gathered through household surveys between June 2010 and August 2011. We find that increased competitiveness in the input market in Sorriso provides producers with a greater diversity of purchasing choices and lower fertilizer prices than producers in Santarém. In addition, Sorriso producers have significantly higher soy yields, largely as a result of different biophysical conditions, technologies, and land use history. Despite higher costs and lower yields, producers in Santarém (located adjacent to an international port) receive substantially higher soy prices than producers in Sorriso, so average profits in both regions were nearly identical in 2011. Within each case we find that yields, costs, and soy prices vary greatly between farmers. Yields are not linked to management practices, but they are linked to credit sources and land use history. More specifically, producers who use subsidized government credit have higher fertilizer usage and yields than producers who use loans from agribusiness. Additionally, producers who have been producing soy on their farm longer have substantially higher yields. Producers who purchase inputs from resellers, rather than cooperatives or manufacturers, pay 10% more for fertilizer on average, but do not use less fertilizers or have lower yields. Regardless of supply chain configurations, individual soy prices, and overall profits, vary substantially depending on when producers market their grain, as a result of monthly volatility in prices. We conclude that differences in supply chain configurations explain individual variations in soy costs and yields, but not regional differences in profits, since cost and yield advantages in Sorriso are offset by lower soy prices.

S31.OC.05

Biodiversity mapping to identify priorities for conservation and restoration in human-modified landscapes of the eastern Amazon.

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One of the greatest challenges facing the development of sustainable management systems in human-modified landscapes lies in maintaining ecological resilience and the long-term persistence of native biodiversity across multiple landuse mosaics. We use systematic conservation planning tools to identify priority conservation areas and priority areas for regeneration on degraded land in regions of the eastern Amazon. Extensive spatial data on bird, invertebrate and tree biodiversity were coupled with a range of GIS and remote sensing data to model species distributions and biodiversity patterns across a range of landuse types and forest conditions. Models were used to map biodiversity across a 2 million hectare region of the eastern Amazon (Paragominis municipality) under current, and possible future, landuse scenarios. The resulting maps were used as inputs to Zonation systematic conservation planning software, which was used to identify priority areas for conservation or restoration based on present, and potential future, contributions to regional biodiversity and connectivity. We discuss how our results can inform spatial conservation planning, and how the work can be extended to include indicators of socio-economic condition to inform multiple-objective landscape planning.

S31.OC.06

THE IMPORTANCE OF DEGRADATION ON TROPICAL FORESTS

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Although several studies have quantified carbon stocks and floral diversity in tropical forests, very few have done so in degraded forests (e.g. logged forests, burned forests). This represents a major shortcoming as degraded forests cover a very large area and the avoidance of degradation offers an important, and relatively low-cost, REDD+ implementation activity. We sampled 266 forest plots (10X250m) in two regions of the Brazilian Amazon, Santarém and Paragominas, covering an extensive gradient of forest degradation. In each plot an assessment was made of above and below ground carbon stocks; including trees, palms, lianas, coarse woody debris, fine roots, leaf litter and soil. To access forest degradation we coupled ground-based evidence of past anthropogenic disturbance with a historical degradation index generated by analyzing a chronosequence of satellite images (1988-2010). Results have shown that both carbon stocks and floral diversity vary significantly across different types and levels of forest degradation, with wildfire being the single disturbance event to cause a significant change in both study regions. Also, we found that increasingly degraded primary forests become more similar to secondary forests in terms of carbon stocks and floral diversity; demonstrating how depleted such areas can be after repeated degradation events. Some results varied between study regions, illustrating the importance of regional history in determining the legacy effects of past disturbance. These novel findings contribute to a better understanding of how widespread degradation affects both carbon stocks and biodiversity in tropical forests. Specifically regarding REDD+ programs, our results demonstrate the need to account for degradation processes when trying to align carbon and biodiversity goals and safeguard carbon stocks in the long-term; otherwise such programs might fail to achieve their targets.

S31.OC.07

AVIAN RESPONSES TO AMAZONIAN LAND-USE CHANGE

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The 6.2 million km^2 of Amazonian forests play host to the greatest expression of tropical biodiversity on the planet and are imperilled by the world's highest rate of forest destruction - nearly 6000 km^2 per year. Here we present data on avian responses to habitat loss, subdivision and degradation from three different deforestation frontiers (Alta Floresta, Paragominas and Santarem/Belterra) of varying landscape histories in the eastern Brazilian Amazon. Although we found patch size to be the most important predictor of species richness, forest structural integrity (patch quality) was crucial in determining species composition, with degradation driving a predictable loss of forest-dependent species and increase in more disturbance-tolerant, geographically wide-ranging species. Forest bird species richness was correlated with changes in tree species richness, suggesting that both structural integrity and tree diversity are important in providing the conditions for high species packing. Although older secondary forests played host to many disturbance intolerant forest bird species, younger secondary forests were found to be relatively depauperate and dominated by edge forest species. Using a combination of published inventories, specimen records and documented sight-records dating back to the turn of the 19th century, we are also able to investigate historical changes in the land bird communities of eastern Pará state, Brazil and found abundant evidence for local extinctions of many forest-dependent species taking place over a century ago. Additional work on deforestation modelling coupled with systematic reviews suggest that the importance for avian conservation of south-eastern Amazonia has been underestimated, with vocal and phylogenetic data revealing a widespread underestimate of restricted-range species, many of which will qualify as threatened on the global Red List.

S31.OC.08

Recovery of forest biodiversity and carbon stocks following degradation and natural regeneration in the Amazon

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Forest conservation policies and incentives typically account only for forest cover, and do not incorporate measures of species composition and the overall conservation status of such forests. Even the basic definition of forests in global negotiations (e.g. the Clean Development Mechanism) is inadequate, considering only total forest area, canopy cover and tree height. This oversimplified perspective is worrying because severely degraded and newly regenerated areas are often afforded the same status as pristine forests, despite having a much lower environmental value in terms of carbon, biodiversity and other important ecosystem services. Here we present a detailed assessment of the depletion and recovery of carbon stocks and faunal and floral biodiversity following a range of historical disturbances and land-use abandonment in two regions of Eastern Amazon – Paragominas and Santarém – encompassing approximately 3 million hectares. We used a nested sampling methodology (250 forest plots distributed in 36 catchments across a gradient of cumulative deforestation in the two regions). We aimed to evaluate 1) the timing of pixel-scale degradation events as well as past forest loss for a 22-year period (1988-2010); 2) the relative value of varyingly degraded and regenerating forests in terms of above-ground carbon stocks and the diversity of trees, birds and dung beetles. We present depletion and recovery curves for carbon and biodiversity across forests in different stages of degradation and forest regeneration following land agricultural abandonment, and show that these are both highly variable across each study region and exhibit marked spatial discontinuities at local scales. We interpret our results with regard to the implementation of different policy options, including the relative value of different REDD+ activities (e.g. avoiding degradation vs. enhancement of carbon stocks) and alternative measures for compliance with Brazilian legislation for forest conservation on private lands (e.g. off-farm offsets vs. on-farm restoration).

S31.OC.09

CHANGING PATTERNS OF SOIL FERTILITY AND BELOW GROUND CARBON IN HUMAN-MODIFIED AMAZONIAN LANDSCAPES

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The conversion of natural vegetation to other agroecosystems is considered as the main cause of carbon (C) emission to the atmosphere and decrease of natural soil fertility. In Brazilian Amazon, those effects are very intense due to deforestation and agricultural expansion. It is essential to note that the soil management is fundamental and very important to regulate the soil quality, enhancing the capability to support plant grows and their appropriate development. Thus, in this study we determined the impact of human activity on soil fertility and below ground C in areas under agricultural expansion in Santarem region, Para State. In order to do so, soil samples were collected at three different depths: 0-10, 10-20 and 20-30 cm on five points (replicates) along one transect. This procedure was done in 173 transects which have the main land uses (mechanized agriculture and pastures) and the results were compared with areas under native forest. At the pasture areas we observed the highest values of pH (H_2O), P, Na^+ and Ca^{2+} while at the native forest these values were lower. For areas under mechanized agricultural we observed high values of K^+ and Mg^{2+} indicating the influence of fertilizer applications. For these same samples soil C stocks were quantified and the results showed that the highest value was found for the native area in the 0-30 cm layer (55 Mg ha^{-1}) and the lowest was observed for pasture areas (47 Mg ha^{-1}). Based on these results we may conclude that in this region, the conversion from native forest to pastures is changing not only the soil natural fertility but also decreasing soil C stocks and, as a consequence, increasing C emissions to the atmosphere, exacerbating the global warming.

S31.OC.10

Responses of insect diversity and function to landscape change in the Amazon

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Land use change has been shown to cause potentially irreversible alterations in the distribution and abundance of biodiversity across Amazonian landscapes. These impacts have provoked intense debate regarding optimal strategies for reconciling economic development and biodiversity conservation objectives in the region. Traditional strategies for biodiversity protection, such as strict protected areas, have resulted in clear trade-offs between conservation and human landscape exploitation that do not account for potential disruption to the underlying linkages between biodiversity and ecosystem functioning. Where such connections are recognized it is assumed that any change in biodiversity necessarily has negative consequences for ecosystem functioning and associated service production. We evaluated four scenarios of anthropogenic impacts in the Brazilian Amazon in order to test the general hypothesis that intensity of use leads to a joint loss of biodiversity and ecosystem function. The scenarios were representative of four common types of human-impact found in the Brazilian Amazon: vertebrate hunting and selective logging in forest ecosystems, and traditional (small-holder agroforestry mosaics) and mechanized agriculture. We used dung beetles as a model study group and the ecological functions performed by these insects (secondary seed dispersal, dung removal and soil removal) as indicators of change in ecosystem functioning. Across all four gradients dung beetle communities were negatively affected by increases in the intensity of human use. However, in contrast the ecological functions performed by dung beetles did not exhibit a uniform response in relation to changes in the insect community. Rates of change in ecological functions were associated more closely to changes in total insect biomass than to species richness, although the magnitude of the observed effects were context-dependent. Although further work is needed, our results demonstrate the importance of considering changes in both biodiversity and biodiversity mediated functions when developing conservation and management strategies for human-modified landscapes in the Amazon.

S31.OC.11

Biotic condition of freshwater systems in human-modified Amazonian landscapes

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Assessments of freshwater condition depend upon the accurate measurement and analysis of abiotic and biotic variables that can help reveal changes in biotic integrity. Physical stream habitat characteristics play a crucial role in shaping the structure and composition of aquatic communities, and can be strongly determined by catchment scale environmental characteristics and anthropogenic impacts. Interactions between abiotic and biotic features of stream habitats can vary markedly in strength across different spatial scales, yet very few studies have focused on understanding these interactions, especially in highly diverse human-modified environments. Here we investigate the impacts of different catchment scale land-uses on instream physical habitat and fish communities in the deforestation frontier of the Brazilian Amazon. We sampled fish communities in 95 small streams in the regions of Santarém and Paragominas in the state of Pará, encompassing four river basins. In each stream we also collected detailed information considering different physical habitat characteristics related to channel morphology, substrate, fish cover, woody debris, riparian vegetation cover and structure, and human disturbances. High resolution satellite images were used to asses patterns of land-use. We present results showing changes in biotic integrity, as well as fish alpha and beta diversity across gradients of human-impact at both stream and catchment scales. We also illustrate the importance of catchment scale land-use patterns on instream habitat structure and the buffering effect of riparian forest strips on the impact of agricultural landscape change on the aquatic biota. These data provide the first comprehensive assessment of regional-scale landscape change on the biotic integrity of stream communities, and represent an important contribution towards the development of sustainable land-use strategies for integrated terrestrial and freshwater systems in the Amazon.

S31.OC.12

Fire and the Future of Amazonian Forests

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Forest fires in the humid tropics have a negative impact on biodiversity, ecosystem services such as carbon storage and rural livelihoods. Fire is also set to play a critical role in determining the future integrity of the Amazonian biome and could precipitate large-scale forest dieback with concomitant impacts on the global climate system. Drawing on new social and ecological data collected in three areas of the eastern Brazilian Amazon, we examine factors that are likely to increase the likelihood of forest fires in the Amazon basin. These include (1) changes in forest flammability relating to forest degradation and subsequent changes in floristic composition, and (2) changes in the prevalence of ignition sources from emerging trajectories of agricultural expansion. We then assess the policy levers that could help prevent an increase in forest fires, evaluating i) the potential for payment for ecosystem service schemes (such as REDD+) to protect the most vulnerable forests, ii) the effectiveness of reserve creation, and iii) the impacts of agricultural changes, such as the spread of perennial crops. While most of the evidence regarding climate change and forest flammability suggests forest fires will become increasingly common in Amazonian forests, our findings indicate that with appropriate intervention this outcome is far from inevitable. However, careful consideration is required because actions to reduce fire-use could also have detrimental impacts on the large number of smallholders still dependant on slash-and-burn agriculture.

S31.P.01

Environmental correlates of hunting and bushmeat consumption in the Amazonian agricultural frontier

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Hunting is an important source of protein for rural populations but a major threat to game animals. Identifying the likely environmental determinants of hunting is thus crucial for developing strategies for both conservation and food security of local human populations. However, current knowledge relies on small-scale studies that encompass highly restricted gradients of environmental variability, thereby limiting our understanding of hunting determinants at larger spatial scales. We address this problem by investigating the influence of landscape-scale forest cover and distance to urban centers on the frequency of households that hunt and/or consume bushmeat, using data from a survey of 318 households across 16 spatially discrete landscapes (~4.000-ha) in the eastern Brazilian Amazon. We hypothesize that the frequency of households hunting and consuming bushmeat should be higher in landscapes with a large proportion of forest remaining (higher availability of game animals) and far from urban centers (low availability of alternative sources of protein), since the relative benefits of hunting should increase with increasing game availability and decreasing access to alternative sources of protein. We used an information theoretic model selection approach to compare a set of candidate models describing the relationships for both hunting and consumption. We show that hunting was best explained by forest cover alone, whereas consumption was best explained by distance to urban center, though adding forest cover increased model fit. Importantly, bushmeat consumption was more frequent than hunting for many landscapes, particularly in areas with lower forest cover and nearer to urban centers. This indicates that bushmeat trade or sharing may contribute to consumption in areas where game is already depleted, increasing hunting pressure in diminishing areas of high forest cover. Because distance to urban centers is a good predictor of consumption, improved access to alternative sources of protein may reduce hunting pressure by reducing game consumption.

S31.P.02

Instream and landscape influences on fish species composition in Brazilian Amazon

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Habitat structure is frequently related to the composition of the biotic assemblages and ecological processes in streams by providing a wide variety of physical conditions. These physical habitat characteristics can related with the landscape in a local or regional scale, also reflecting in species composition. This study aimed to investigate whether the fish species composition of streams is associated to instreams characteristics and landscape features. We studied fish assemblage, physical habitat, limnological and land use variables in 45 streams of 1st, 2nd and 3rd order and with different integrity levels from Tapajós River basin, Santarém and Belterra municipalities, Pará State. In each stream, a 150 m stretch was selected and fish were sampled with standardized methods; physical habitat were characterized considering aspects such as riparian vegetation, channel morphology, fish cover, substrate type, presence and volume of woody debris; land uses categories (forest, pasture, agriculture and urban area) were quantified in terms of percentage of coverage considering the drainage scale. We didn't find a pattern of streams similarity in terms of species composition with regard to physical habitat neither land use or limnological variables. The models produced by the DistLM analysis suggested a great number of variables related to fish species composition and with a little percentage of explanation: 6.5% for land use, 3.8% for limnological and 3.6% for physical habitat variables. The model considering all variables together reached around 20% of explanation and suggested the retaining of all of them. These results highlight the complexity and difficulty of selecting few abiotic parameters predicting fish species composition in a high diverse environment such as Amazon streams.

S32.OC.01

The End of Deforestation in the Brazilian Amazon

Nepstad DC[1], Carter JC[2], Bowman M[3], Cattaneo A[3], Rodrigues H[4], Schwartzman S[5], McGrath DG[1], Stickler CM[1], Lubowski R[5], Piris-Cabezas P[5], Rivero S[6], Alencar A[3], Soares-Filho BS[4], Almeida O[1], Stella O[1], Lima A[1], Merry F[1], Moutinho P[1] - [1]IPAM, [2]Aliança da Terra, [3]WHRC, [4]UFMG, [5]EDF, [6]University of Florida

Brazil has two major opportunities to end the clearing of its Amazon forest and to reduce global greenhouse gas emissions substantially. The fi rst is its formal announcement within United Nations climate treaty negotiations in 2008 of an Amazon deforestation reduction target, which prompted Norway to commit $1 billion if it sustains progress toward this target (1). The second is a widespread marketplace transition within the beef and soy industries, the main drivers of deforestation, to exclude Amazon deforesters from their supply chains (2). According to our analysis, these recent developments finally make feasible the end of deforestation in the Brazilian Amazon, which could result in a 2 to 5% reduction in global carbon emissions. The $7 to $18 billion beyond Brazil's current budget outlays that may be needed to stop the clearing [a range intermediate to previous cost estimates (3, 4)] could be provided by the REDD (Reducing Emissions from Deforestation and Forest Degradation) mechanism for compensating deforestation reduction that is under negotiation within the UN climate treaty (5), or by payments for tropical forest carbon credits under a U.S. cap-and-trade system (6).

S32.OC.02

Steps towards frontier governance in Mato Grosso II: the Brazilian Forest Code and REDD

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In an effort to reduce global greenhouse gas emissions from tropical forest conversion by tapping into emerging forest carbon markets, federal and state governments of tropical nations are developing programs to achieve reductions in deforestation and forest degradation. In addition to establishing a deforestation reduction target under the Brazilian National Climate Policy, Mato Grosso state is developing a state-wide REDD program under the auspices of the Governors Climate Forest Taskforce (GCF). Although historically responsible for the highest deforestation rates in the Amazon, Mato Grosso state now accounts for 59% of deforestation reduction already achieved under the BNCP goals over the last 8 years. Here, we explore the potential of Mato Grosso to achieve further reductions under the current and proposed Forest Code, as well as under two Zoning Plan proposals. We estimate the emissions reductions below (a) a historical baseline and (b) four alternative policy frameworks which could be achieved on private and public lands in the state. We also estimate the price of carbon that would be needed to offset the opportunity costs incurred by private landholders of complying with each alternative framework used to achieve the state target. Finally, we compare the alternative scenarios in terms of several ecological indicators to evaluate the performance of each in providing co-benefits beyond carbon stocks.

S32.OC.03

Building remote sensing databases for sugarcane and soy monitoring in Mato Grosso

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Remote sensing images have been used to map the sugarcane crop since 2003 in South-central region of Brazil which is responsible for almost 90% of Brazilian's sugarcane production. These maps are used to forecast sugarcane area available for harvest, to evaluate the direct land-use change related to sugarcane expansion, and to monitor the pre-harvest sugarcane burning practice. In the state of Mato Grosso (MT) the sugarcane area has increased almost 70% during the last decade going from 170 to 288 thousand hectares. Sugarcane expansion in MT has been observed mainly on pasture land (77%) followed by annual crops (21%) and forest (2%). The relative area of pre-harvest burning has decreased in MT from 44% in 2006 to 17% in 2011. The remote sensing images have provided objective information contributing to several environmental issues related to sustainable ethanol production from sugarcane in MT. Another application of remote sensing images in MT is the monitoring of soy plantations in deforested land in the Amazon biome. Within the Soy Moratorium context farmers who planted soy in opened areas after July 24, 2006, would not have their production commercialized by international soy trader companies. Remote sensing time series of the MODIS sensor combined with Landsat images, aerial survey, and field work have been an effective method to detect and evaluate the amount of soy plantation in recent deforestations. From 2007 to 2010 a total of 688,460 ha have been deforested in the Amazon biome of MT according to the Amazon Deforestation Monitoring Project (PRODES). Soy plantations were found in 8,385 ha which corresponds to 1.2% of the total deforested area in MT during the Soy Moratorium. Results indicate that the moratorium is having an inhibitory effect on deforestation and soy has been a minor driver of recent deforestation.

S32.OC.04

The system for environmental licensing of rural properties in the Brazilian Amazon: key factors for landowners' participation and resultant spatial patterns

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The "Sistema de Licenciamento Ambiental de Propriedades Rurais" (SLAPR) was established by the state government of Mato Grosso in the year 2000. SLAPR, based on remote sensing and Geographical Information Systems (GIS) aimed to monitor compliance with Brazil's Forest Code. An important step in complying with the forest code is monitoring the status of individual properties, SLAPR's main objective. The three-stage system composed of: licensing, monitoring and enforcing was developed to enhance environmental management and increase compliance with legislation. The purpose, here, is to identify the key factors in determining the geographical patterns or clustering of properties which joined the system between 2000 and 2006. Both qualitative and quantitative data were used. Qualitative data consisted of interviews with rural landowners, while the quantitative data consisted of the SLAPR property database. Statistical analysis of the data found that the main factors associated with the amount of licensed areas per municipality were identified as: the area of soybean cultivation (positive relation) and the deficit of native vegetation, as a result of previous illegal deforestation (negative relation). The first factor, namely the area of soy cultivation, is explained by the need to compliance with environmental rules, enabling access to credit. The second factor is related to the fact that intensive deforestation was done in some areas and joining SLAPR has meant restore them, It implies a high economic cost. In both cases, it becomes evident that economic stimulus/ constrains was the main factor explaining the amount of licensed areas. Therefore, the study supports evidence that consumer's markets are demanding products which comply with environmental legislation, and thus there is a greater incentive for the improvement of SLAPR as a management tool.

S32.OC.05

Vulnerability of smallholders' livelihood in Amazon frontier due to global warming and forest fires

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Climate change has raised increasing concerns about the future of tropical forests in relation to more frequent and intense droughts and consequent widespread of forest fires and forest die-back. Fire risk and economic losses due to escaped fires have an important implication for poverty and inequality in the region. The fire frontier is located in the most populated rural portions of the Amazon (i.e., along the Arc of Deforestation). It is in these areas that new and old government smallholders settlements have been typically located. These smallholders are often the source of deforestation and management fires, but also the main victims of the negative effects of their own fire-based production system. In a scenario of more frequent and intensive drought, these producers would be more likely to be affected by morbidity and respiratory ailments or to be subject to loss of crops and livestock without other means to pay back bank loans than more capitalized landowners in the region. The probable consequences of climate change and widespread fires affecting Amazon small producers have important implications for increasing poverty and inequalities in the region, raising concerns regarding the vulnerability and adaptation potential of the poorest economic group in the region.

S32.OC.06

Managing the global land crisis: harnessing market forces and policy innovation to manage competing interests in the land in Mato Grosso, Brazil

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One of the central challenges of the 21st Century is to successfully manage competing demands on the land in a way that reduces greenhouse gas emissions, conserves natural resources, secures food production systems, and recognizes land rights. The State of Mato Grosso, Brazil (SE Amazon) which has achieved a 0.7% global reduction in GHG emissions through an 85% decline in deforestation (below its average deforestation from 1996-2005) as it increased agricultural and livestock production, has emerged as an important laboratory for examining policy and market approaches for achieving these often conflicting goals. We examine the contribution of (a) market transformation (soy and beef moratoria, commodity roundtables), (b) public policies (deforestation and fire prevention and control, jurisdictional REDD, tax policy on agricultural products); and (c) sector-specific, volunteer action (e.g. the Registry of Socio-Environmental Responsibility) to Mato Grosso's achievement.

S32.OC.07

Hydrological consequences of deforestation and postdeforestation land management in the Amazon's agricultural frontier

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Increasing demand for agricultural commodities has driven high rates of deforestation in the Brazilian Amazon over the last two decades. The resulting changes in land cover may alter the hydrology, geomorphology, and biogeochemistry of streams by decreasing evapotranspiration and increasing runoff, river discharge, erosion and sediment fluxes from the land surface. Postdeforestation land use and management may either magnify or mitigate the negative environmental consequences of removing native vegetation. This study examines the hydrological consequences of recent land cover and land use changes in the Amazon's agricultural frontier. At the local scale, our results indicate that headwater streams in agricultural watersheds have both higher water temperature and increased discharge compared to forested watersheds of similar size. Increases in stream discharge were attributable to the decreased evapotranspiration (ET) resulting from conversion of forests to soybeans and pasture grasses, whereas higher stream temperatures were primarily due to land management variables, such as the density of upstream impoundments and presence of riparian forest buffers. At the regional scale, our observations indicate large increases in discharge in the Araguaia and Tocantins River Basins as a result of deforestation-related reductions in ET. Modeling results indicate that continued deforestation may lead to future reductions in regional precipitation as a result of large-scale declines in ET. Furthermore, we document the existence of nearly 10,000 impoundments in the headwaters of the Xingu Basin, indicating that local management decisions may have large cumulative impacts on stream temperature and connectivity at the landscape scale. Our results suggest that the existing network of Amazon protected areas and indigenous reserves plays an important role in maintaining ecosystem hydrological services by maintaining regional forest cover, but its ability to do so in the long term will depend on the quality of land and riparian corridor management on private properties in the surrounding landscape.

S32.OC.08

Large mammal conservation in an agricultural frontier: current and future scenarios

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To assess the potential for and threats to mammal conservation in the Xingu headwaters region we used spatially explicit analyses that integrate field data with other landscape level datasets. Field data collection included sampling of medium to large mammal species presence and abundance in 5 rural properties and a set of habitat characterization measures. Thirty-seven mammal species were recorded in the region and density was estimated for five species. We combined field data with satellite image-derived and other spatial datasets to model potential large mammal habitat. We superimposed this map with a map of areas suitable for large-scale mechanized agriculture to assess opportunities for habitat conservation and restoration while taking into account the possibilities for agricultural expansion. Finally, to evaluate the effects of land-cover change driven by agricultural expansion on large mammal populations in the region, we developed alternative landscape scenarios based on current or proposed land-use legislation (Forest Code--CFC, State Zoning Plan--ZSEE) and other management practices (Registry of Social-Environmental Responsibility--RSR) for the region. We compared these scenarios to one that simulated the continued expansion of mechanized agriculture, based on historical patterns and trends (Business-as-Usual—BAU). We compared the scenarios in terms of the level of habitat fragmentation they generated as well as the risk posed to large mammal habitat in terms vulnerability to clearing or inaccessibility. We assessed the area of suitable (still intact) habitat that would be threatened by agricultural expansion (because it coincides with suitable area for agriculture) under each of the scenarios, as well as those areas already cleared that could be restored at minimum cost because of their low suitability for agricultural production.

S32.OC.09

Pesticide use and biodiversity conservation in agroindustrial Southern Amazon

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The debate regarding the reconciliation of biodiversity conservation and agricultural production has been cast as a decision between ´land sparing´ - managing farmland to maximize yields so as to spare native land for conservation elsewhere - and ´land sharing´ - integrating both objectives on the same land using wildlife-friendly farming methods, at the cost of reduced yields and therefore need for larger areas. For the production of commodities in Southern Amazon intensification has been the rule. Where this model is to prevail, we should be concerned that significant tracts of native land are set aside as connected preserves embedded in a permeable matrix; and that hazardous practices in farmland are minimized and self-contained so that that they do not reach adjacent preserves. Pesticide and fertilizer application is an important class of land management practices that is hazardous to biodiversity in agricultural fields, with potential to affect biodiversity away from plantations via drift, runoff and infiltration. Towards a risk assessment of pesticides we built a database of fate-and-effect characteristics of all 784 pesticides and 207 active ingredients (AIs) used in biofuel crops in Brazil. We then focused on soybean production and crossed this information with quantitative information of agrochemical use in Fazenda Tanguro, model farm representative of high profile agribusiness. More than 10 tons of 26 AIs were used in Sector Alvorada over a soy cycle. One is included in the priority list ´Dirty Dozen´, 7 are potential groundwater contaminants, 14 are of known chronic aquatic toxicity, and 9 are of high or very high acute aquatic toxicity. We are currently measuring residues in water, sediment and biota to document contamination; establishing collaboration to model the environmental fate-and-effect of pesticides away from plantations; and formulating a rank of particularly hazardous, mobile and/or persistent pesticides for voluntary withdrawal by producers.

S32.OC.10

Testing the Amazon's savannization hypothesis: Effects of induced-tree mortality by fire on the establishment of C4 grasses

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Climate change and land-use may interact synergistically to increase fire disturbance in tropical forests, having a cascading effect on ecosystem processes that ultimately promote the establishment of C_4 African grasses. However, the mechanisms by which these grasses invade tropical forests remain poorly understood. Based on experimental 50-ha plots burned annually (*B1yr*) and every three years (*B3yr*) in a transitional forest of Mato Grosso (12º50'S 52º25'W), we tested the predictions that: (1) grass invasion from the forest edge into the forest interior increases with increasing fire frequency; (2) the presence of non-native grasses decrease linearly from the forest edge into its interior due to light limitation; (3) the establishment of *Brachiaria decumbens* in the forest interior (250 m from the forest edge) increases as a function of decreasing canopy cover and increasing seed availability. One year following the initial fires of 2005, grass invasion into the forest interior was modest in the burned plots compared to the unburned control, but advanced 40-60 m into the forest by 2009. The highest probabilities of grass invasion (≥ 60 m from the edge) were observed in the plot burned every year (63%) instead of every three years (40%). The establishment of *B. decumbens* in the forest interior was dependent on both the LAI and seed availability; there was a probability ≥ 50% of finding those grasses when LAI ≤ 2.5 m^2m^{-2}. Our results indicate that the probability of grass invasion in this transitional forest increased with increasing with fire frequency, seed availability of C_4 grasses, and canopy openness.

S32.OC.11

Predictive modelling of contagious deforestation in the Brazilian Amazon

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Tropical forests are experiencing fast change mainly due to the quick expansion of large agriculture activities such as cattle ranching and soybean plantations. With a predicted increase in human population and, consequently, a rise in demand for agricultural products, the future of these forests is at stake. In order to predict possible negative impacts and evaluate different conservation strategies it is vital to be able to predict accurately the areas more likely to be deforested in the future. Here, we introduce a dynamic and spatially-explicit predictive model of deforestation. Our model differs from existing models in three important ways: (1) it is a probabilistic model rather than a deterministic one; (2) the overall deforestation rate emerges naturally from the model based on local deforestation probabilities, rather than being assigned top-down; and (3) deforestation is modelled as a contagious process. We parameterized the model against satellite observations of deforestation for the Brazilian Amazon (BA), which confirmed that forest near roads and near already deforested areas is more likely to become deforested in the near future. Protected areas, on the other hand, play a vital role in preventing deforestation, especially indigenous lands. Under a business-as-usual scenario, the south-eastern region of the BA has a very high probability of becoming heavily deforested by 2050. Although much more inaccessible, the north-western region of the BA will still experience deforestation events that are aggravated whenever there is a road nearby or lack of protection. This modelling procedure can also be used to project the potential impact of different scenarios such as the impact of the construction of new roads and/or the implementation of new protected areas.

S32.OC.12

A Decade of Deforestation and Degradation in the Southeastern Amazon: Implications for other tropical regions

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Over the last several decades, the forest and savanna regions of Mato Grosso have been a prototypical example of expansion and intensification of large-scale, industrial agriculture in the tropics. Major drivers are international and domestic demand for feed and beef. This presentation explores whether commercial agriculture as a driver of deforestation, similar to the experience in Mato Grosso, is widespread in countries across the tropics. Analysis of country reports on drivers of deforestation and degradation for 46 tropical and sub-tropical countries reveals that commercial agriculture is the most prevalent driver of deforestation, accounting for 45% of deforestation, followed by local/subsistence farming (37%), mining (7%), infrastructure (8%), and urban expansion (3%). Drivers of degradation are timber extraction (predominant in Latin American countries), fuelwood and charcoal (predominant in Africa), uncontrolled fire and livestock grazing. Drivers of deforestation and degradation vary in a generalizable pattern depending on a country's categorization within a forest transition model, indicating that drivers similar to those in Mato Grosso will become more prevalent across the tropics with economic development and connections to international markets. Experiences in Mato Grosso indicate that deforestation responds to a complex suite of market and policy forces, providing possible pathways for other regions to increase agricultural production while conserving forests through investments in policy incentives and institutional capacity.

S33.OC.01

Is REDD a good deal for conservation in Madre de Dios, Peru?

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A series of REDD projects are taking place in Madre de Dios, Peru. Allegedly, they refer to themselves as early nested initiatives, but little evidence exists that these pilot projects are integrated and coordinated within both departmental and national programs. In addition, voluntary carbon associations have established standards for MRV (Measuring, Report, and Verification) methods that are unsound, specifically regarding the use of deforestation simulation models to fix forward-looking baselines for crediting purpose. Lack of coordination between governmental programs and private initiatives together with the use of unfounded methods to appraise deforestation reduction efforts may lead to further uncertainties and insecurity in the emerging carbon market, which in turn could undermine its near-term prospects. Here, we review the current framework of REDD in Peru, focusing on Madre de Dios region, to point out pitfalls of these early initiatives. In contrast, we present an approach that integrates REDD to a comprehensive regional planning aimed at reconciling sustainable development with forest conservation. We posit that investments from REDD should be channeled to increase revenues from sustainable forestry of both timber and non-timber products, as well as to promote the region's thriving ecotourism and to introduce low-carbon agriculture practices to small landholders situated along the interoceanic highway. To demonstrate our point of view, we performed a series of economic land-use analyses in the region that weigh potential rents from forestry and other forest-friendly economic activities with those of a basket of agricultural uses (soy, sugar-cane, cattle ranching, and small landholder agriculture). These analyses not only address the territorial vocation of Madre de Dios, but also indicate pathways to harness economic to ecological sustainability in the region.

S33.OC.02

Changes provoked by forest fragmentation in the Amazonian system

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The importance of the environmental services based on intact tropical forest and its functionality may be extremely diminished when the landscape originally compounded by continuous forest became a fragmented scenario. In the last decades, almost 18% of the continuous Brazilian Amazonian forest was deforested for different reasons. After forest conversion or shifts of land-use along time, thousands of forest fragments were left behind compromising the functionality of the original forested landscape. Consequently the new patched landscape changes its environmental services values. Biological Dynamics of Fragmented Forest Project (BDFFP), cooperation between INPA and STRI and part of the National Institute of Science and Technology for the Environmental Services of Amazonia (INCT-SERVAMB) in Manaus was created 33 years ago to study the consequences of forest fragmentation. Along three decades, an intensive and continuous biodiversity monitoring program has been measuring changes caused by forest fragmentation, showing under such process the role of fragment's size and the edge effects on forest remnants. Studies revealed after fragmentation, even in a not intensively fragmented landscape as in Central Amazon, a high rate of local extinctions and a forest under a hyper-dynamic regime (higher turnover). Changing in forest structure and composition drove the system to a collapse of biomass and a natural rehabilitation of gaps and forest's edges by secondary forests. Under an incessant deforestation in the Brazilian Amazon Basin, such data gathered by BDFFP should be useful to allow a better evaluation of the environmental services in landscapes under any deforestation regime.

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S33.OC.03

Are environmental services affected by successional pathways in secondary Amazonian rain forests?

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Environmental services in the Amazon include climate regulation, hydrological fluxes, ecological processes mediated by biodiversity, such as pollination, decomposition, and nutrient cycling, and Carbon sequestration and storage. When primary forest is clearcut, these services are lost, but the regeneration of altered and degraded areas could help to restore part of them. In the Amazon, areas subject to different use histories, develop plant communities with different structure, floristic composition, dominance patterns, and regenerative capabilities when abandoned. Areas under intensive use, such as abandoned pastures, follow a successional pathway that was described by Connel and Slayter as arrested succession, due to the dominance of inhibitor species preventing the regeneration of others. On the other hand, areas dominated by facilitator species, such as Cecropia, follow a faster restoration process, and succession seems to advance faster on them. For 12 years we accompany the population and biomass dynamics of 18 transects that form chronosequences of secondary forests, in an area north of Manaus, Amazonas, Brazil. They vary between 2 and 26 years, and we monitor annually about 6000 individuals for growth, mortality and recruitment. All individuals are identified to species or morphotyped. Rates of biomass increment are different in abandoned pastures, generally dominated by Vismia, and in areas clearcut and abandoned, generally dominated by Cecropia. This results in higher biomass stocks in Cecropia-second-growth than on Vismia-second-growth. Besides higher Carbon sequestration, Cecropia-dominated second-growth also host a larger number of plant species, and have a faster turnover than Vismia-dominated second growth. This indicates that the succession advances more rapidly in areas with low intensity use histories, and that areas abandoned after intensive use have their regeneration potential compromised. Therefore, environmental services of secondary forests of the Amazon are variable and depend on previous use history.

S33.OC.04

Expansion of oil palm cultivation in the Amazon: potential impacts on carbon fixation and water use

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The demand for plant oils for food and biofuels has increased significantly and the participation of oil palm in the world market is increasing. The Brazilian Program for Sustainable Oil Palm (launched in June 2010) aims at expanding the cultivation of oil palm by up to 350,000 hectares over the next 10-12 years focusing on degraded pastures and other altered areas. Due to oil prices and future projections of increasing oil demand, large projects have settled in the state of Pará, increasing the cultivated area from 70,000 to 120,000 hectares in the last 2 years. Converting former slash-and-burn areas that are used for agriculture and pasture to oil palm plantations has impacts on carbon sequestration and on greenhouse-gas emissions since the former systems usually functioned as carbon sources due to land degradation and fire. The cultivation of oil palm occupies the land for up to 22 consecutive years with great potential to result in a positive carbon balance because photosynthetic rates of *Elaeis guineensis* can reach up to 25 µmol CO_2 m^{-2} s^{-1}, considered high when compared with other tropical pioneer species such as *Racosperma mangium* and *Sclerolobium paniculatum* (~15 µmol CO_2 m^{-2} s^{-1}). Thirteen-year-old oil palms can accumulate 70 Mg ha^{-1} aboveground. To achieve this productivity the palms need ample water supply to satisfy their demands, which result from their crop architecture and large leaf area (up to 380 m^2). The expansion of oil palm is taking place in areas likely to be affected by climate change, which will require the development of drought-tolerant hybrids. Here we discuss the implications of such a scenario for oil palm expansion in Amazonia, based on drought-tolerant materials, rain-fed cultivation systems, and use of water resources in other regions (e.g., Cerrado) and its consequent environmental costs.

S33.OC.05

Land use intensity affects biomass accumulation in Amazonian secondary forests

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Secondary forests or “capoeiras” accounted for 20% of the total deforested area in the Brazilian Amazon in 2006. This study relates land use history and biomass accumulation in a chronosequence of secondary forests in the Apuí municipality, one of the deforestation hotspots in the Amazon. Aboveground live biomass (ABGB) was estimated for trees in 16 secondary forests with ages ranging from 3-23 years of abandonment, and subjected to two previous land uses: eight areas were clearcut and used only once for small farm agriculture and then abandoned (low intensity); eight areas were maintained mainly as pasture experiencing several prescribed fires until abandonment (high intensity). Satellite imagery data between 1985 and 2010 was supplemented with landowner interviews in order to define the secondary forests age and their previous land use history. The point-centered quarter method was used for sampling trees in four diametric classes (1<5 cm, 5<10 cm, 10<20 cm, ≥20 cm dbh) in each quarter. The average accumulation of ABGB was 6.7 $Mg.ha^{-1}.year^{-1}$ and ranged between 10.9 - 193.0 $Mg.ha^{-1}$ in the study area. As expected, biomass was positively related to the abandonment time of secondary forests for both land use intensities ($F_{1,13}$=23.1, p<0.001; ANCOVA). However, high intensity land use prior to the abandonment resulted in a lower stock of biomass accumulated through time ($F_{1,13}$=4.9, p=0.04; ANCOVA), revealing the loss of environmental conditions in supporting forest restoration after high intensity land uses. The results point to the negative effect of inadequate pasture maintenance practices in the Amazon. Depleting the poor soils of the region affects one of the main environmental services played by the secondary forests while reducing biomass accumulation and consequently the amount of carbon it removes from the atmosphere.

S33.OC.06

Avoiding greenhouse-gas emissions from land-use change in Brazilian Amazonia as an environmental service

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The term "environmental services" refers to the role of both 'natural' and anthropogenic in supplying public benefits such as biodiversity maintenance, water cycling and avoidance of global warming. Monetary payments based on these services could offer a sustainable alternative for supporting the rural population in Amazonia, rather than the present economy that is almost entirely based on destroying the forest. Avoiding greenhouse-gas emissions is the closest to providing significant monetary benefits. Debates of this role fall into three groups: the "data battlefield," the "theoretical battlefield" and the "political battlefield." The National Institute of Science and Technology for the Environmental Services of Amazonia (INCT-SERVAMB) is contributing to discussions in all three of these battlefields. On the data front we have improved estimates of biomass of Amazonian forests, especially those in Brazil's arc of deforestation. We also have advanced in modeling the advance of deforestation to reflect the effect of building roads and creating reserves. On the theoretical front we have suggested approaches to the effect of leakage and the value of time in assessing the benefits of Amazonian reserves, and we have contributed to debates on carbon accounting. On the political front we have suggested various ways that Brazil could change its positions in climate negotiations so as to maximize benefits for Amazonia, including taking on a cap (assigned amount) on national emissions and allowing trade of fully exchangeable (fungible) carbon rather than relying on payments through a fund. More information is available at: http://inct - servamb.inpa.gov.br/.

S33.P.01

Managing an intensified Amazonia: Estimating the effect of agricultural intensification of key commodities on ecosystem service delivery in Amazonia

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Agricultural expansion (both in the form of cropland and pastureland) is a persistent pressure on Amazonia's tropical forest resources, increasingly so as population size and income increases cause global demand for calories and protein to rise. Amazonian agricultural systems can meet that increased demand via intensification of current systems, agricultural extensification, or – most realistically – some interrelated combination of the two. This study aims to determine how the ratio between intensification and extensification of key agricultural commodity systems will impact the delivery of a suite of ecosystem services. Our analysis uses a spatially-explicit model that takes climate and management into account to quantify the potential agricultural yield of several commodities driving Amazonian land-use change – sugar, soy, maize and oil palm. We use different relative intensification/extensification scenarios to first satisfy a future calorie demand and subsequently assess changes in carbon storage, landscape ecology metrics, fertilizer addition and irrigation intensity across the Amazon basin.

Preliminary results indicate that in comparison to soybean and sugarcane yields, oil palm and maize yields are relatively more sensitive to intensive management irrigation and fertilizer strategies. In terms of trade offs with ecosystem services, of the four key commodities, oil palm has the highest potential yields (in agricultural systems modeled for high-intensity management) in areas of the basin that have high carbon storage. Where intensification alone cannot meet a given simulation's future demand, we use an extensification model based on an agricultural "suitability" data layer that we validate using sub-national data from the past twenty years. We see our extensification model impact landscape patchiness metrics indicating that aside from a gross loss of habitat, extensification will have implications for the landscape ecology (and associated habitat quality). Finally, in our continued analysis, we hope to determine an optimal intensification:extensification strategy based on changing commodity demand "constraints" while minimizing harm or maximizing desired ecosystem service outcomes or correlates, including nitrogen-use pollution, phosphorus-use pollution, irrigation use, carbon storage and habitat patchiness.

S33.P.02

AGROBIODIVERSITY OF THE CHACRAS AT THE INDIGENOUS COMMUNITIES KICHWAS OF THE ECUADORIAN AMAZON

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Amazon represents 48% of the Ecuadorian Nationwide and it is considered one of the regions with great biodiversity per unit of area worldwide. This region is characterized by a rich culture that comes from the settlement of several nationalities. The indigenous communities Kichwas are characterized for maintaining historically conservation methods and for managing the biodiversity by dynamic productive systems known as Chacras, where there is an interaction between annual and perennial plants species associated to ancestral cultural practices. Therefore, fruit species that are part of the system are also threatened by cultural practices which promote productive systems based on monoculture. The objective of this research was to determine the diversity of fruit species existing in the Chacras of the indigenous communities Kichwas of the Ecuadorian Amazon. Methodologically, it was selected 30 families of three representative communities located at Cantón Loreto of the province Orellana. For the collection of information it was used eight participative tools which were applied to different actors, focal groups, community leaders, key informers, families and responsible for the productive systems. The more representative introduced genus were *Citrus* and *Musa*, however, regarding to local diversity the genus *Theobroma* is the more representative in the chacras. The results demonstrate how the diversity of native fruits species are threatened and how they have been substituted by commercial species. This might be due to the effects from transformations occurred by the process of the economic integration of the region which makes pressure on the biodiversity of the Amazon tropical forest and on the life form of the inhabitants. Nevertheless, it is important to highlight an ancestral cultural practice: the exchange of products among communities, what is a positive effect on the enrichment of biodiversity of the productive systems.

S33.P.03

Wood vegetation structure in a transitional forest of southeastern Amazonia, Brazil.

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The Brazilian Amazon is the largest continuous tropical forest in the world (5.4 million Km^2), storing 100-120 Pg of carbon and housing more than 20% of the terrestrial species in the planet. Over the past two decades, however, a large portion of the Amazon has been degraded by fire and logging, or cleared for the expansion of agriculture fields and cattle ranching. To better understand the effects of deforestation and forest degradation on the forest structure and diversity, we conducted a study in the southern part of the Amazon basin (savanna-Amazonian ecoregion). In particular, we mapped all tree and lianas species with ≥ 5cm DBH (diameter breast height) using three 40x40m plots ($4800m^2$). In total, we identified 700 individuals, comprising 64 species, 46 genera, and 31 botanical families. The density of individuals was 1458 individuals ha^{-1}, while the basal area and biomass were $23.05m^2$ ha^{-1} and 151,21 Mg/ha, respectively. Most of the sampled individuals (54%) were between 5-9 cm in DBH, while larger individuals (dbh between 50 and 54) accounted for only 0.28%. The families Annonaceae, Burceraceae, and Melastomataceae had the highest richness, with five species each. The results indicate that this transitional forest has relatively low floristic diversity, especially in contrast with humid, northwestern Amazon basin, however present a higher density and basal area than other forests located in the central part of Brazil. These results show that forest structure conservation is important, especially for keep of carbon stocks.

Keywords: biomass, tropical conservation, tropical forest, Amazon basin.

S34.OC.01

Non-timber forest products and conservation: what prospects?

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Non-timber forest products (NTFPs) were hailed as a “silver bullet” to provide the economic incentives to conserve standing forests, while contributing to local livelihoods. While the livelihood benefits of NTFPs have been widely acknowledged, the contribution of the NTFP sector to biodiversity conservation is less certain. Despite increasing skepticism of the ability of NTFPs to contribute to conservation, their promotion and development remains a readily implemented tool for many site level conservation projects. However, this study dispels certain assumptions related to NTFP sustainability and the links between NTFP extraction systems and conservation. We conclude that the links are generally tenuous to say the least and suggest that our perceptions of the relative value of NTFPs in terms of biodiversity conservation need to be revised.

S34.OC.02

Not by scientists alone: scientific (des) information and the contribution of traditional ecological knowledge to forest management

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One of the main challenges for management and certification of NTFP's is the lack of basic ecological information. Even for plant species that are widely traded, little ecological information is available and the effect of harvesting remains considerably understudied. In this context the objectives of this work are: a) to identify the main gaps in ecological knowledge about NTFP's; b) testing hypotheses concerning the patterns of available information; and, c) to discuss the role of traditional ecological knowledge in forest management. In order to evaluate the level of current ecological information we selected 30 species commercially harvested for bark and exudates in Latin America and nine ecological variables. We have widely searched databases for papers, dissertations and technical notes which assessed ecological aspects of the selected species. Ecological variables were scored according to the level of available information. We used multivariate analysis and randomization tests to detect possible patterns and relationships between the status of knowledge and key variables. No associations were found between the level of knowledge and production system, geographic range, phylogenetic aspects or the degree of multiple extraction (timber and non-timber uses) of the species. The only key variable that presented an association with the level of scientific information was related to the size of the market, with species internationally traded generally having more information available. Scientific knowledge related to pollination, seed dispersal, propagation methods and phytosociology of the species can be considered intermediate while population structure and dynamics, genetic diversity, effects of harvesting on the natural populations and sustainable harvesting cycles are poorly understood for the most of the species studied. Using case studies we have demonstrated that some of these gaps could be addressed by recognition and documentation of traditional ecological knowledge.

S34.OC.03

Products of socio-biodiversity in southern Brazil: contribution to the debate on the political and economic dimension

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The “new” debate about the products of socio-biodiversity represents the reconfiguration of the debate on the harvesting of Non-Timber Forest Products which proposed the valuation of these products related to timber products, as well as the establishment of parameters of ecological sustainability of extractivism. As the cultural dimension is incorporated and becomes object of public policies, the debate on harvesting of NTFP is increased reaching the goal of enhancement of the cultural and environmental patrimony provided in the Convention of Biological Diversity. This initiative adds to the rural policies that are articulated to food security and nutrition, incorporating the debate about poverty, social inclusion and biodiversity conservation. These issues are discussed within public policies through the articulation of family farming production and people and traditional communities to institutional markets. Besides that, there has been a search for a valuation of products through a rapprochement of the consumption of production from short chains of marketing. These chains try to make the farmer/harvester not to keep being just a supplier of raw materials. Thus, the production and consumption are linked by direct contacts between consumer and producer, according to the seasonality of production. With this, new forms of social relations and associations are created with alternative standards of quality, generally favoring the ecological, the artisanal and the local. In this paper studies on socio-biodiversity products are discussed, associated with the management of local communities, showing that the reality of southern Brazil that unlike the Amazon region is seriously pressed by legislation: a) environmental, about management and marketing of native species of Atlantic Forest, as *Schoenoplectus californicus, Rumohra adiantiformis, Araucaria angustifolia* and *Euterpe edulis*; and b) health, for species related to food security and nutritional which are benefited as the fruits of *E. edulis* and seeds of *A. angustifolia*.

S34.OC.04

The Effects of Processing Non-timber Forest Products and Trade Partnerships on People's Well-being and Forest Conservation in Amazonian Societies

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This study evaluated whether processing non-timber forest products (NTFP) and establishing trade partnerships between forest communities and companies enhance the outcomes of NTFP commercialization. In particular, we evaluated whether product processing, partnerships, or their combination was associated with a number of outcomes related to the well-being of forest inhabitants and forest conservation. We based our analyses on ethnographic and quantitative data (i.e., survey and systematic observations) gathered at seven communities from five societies of the Brazilian and Bolivian Amazon. Our results indicated that product processing and partnerships do not represent a silver bullet able to improve the results of NTFP commercialization in terms of well-being and conservation indicators. Compared with cases that lack product processing or a partnership, households adopting partnerships but not product processing were most often associated with improvements in economic proxies of well-being (total income, NTFP income, income regularity, and food consumption). In comparison, the combination of product processing and partnerships was associated with similar outcomes, although this was the only strategy associated with increases in income equality between women and men. Unexpectedly, product processing alone was associated with negative outcomes in the well-being indicators. All of the investigated strategies were associated with less time spent in social and cultural activities. With respect to conservation, the three strategies produced similar results: while household deforestation tended to decrease, the hunting impact (hunting effort and wild animal offtake) increased. Our results indicate that establishing partnerships may enhance the outcomes of NTFP trade in terms of the financial outcomes of local communities, but practitioners need to use caution when adopting the processing strategy and they need to evaluate potential negative results for indicators of social and cultural activities. With respect to conservation, the three strategies are promising for reducing deforestation, but more pervasive impacts, such as hunting, might increase.

S34.OC.05

Subsistence and commercialization: contributions of NTFPs to food security and nutrition

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When they first gained attention in research and policy non-timber forest products (NTFPs), and their potential commercialization, were heralded as a win-win solution for biodiversity conservation and local livelihoods.

Although their role in local subsistence has been overshadowed by enthusiasm for potential for income-generation, NTFPs make significant contributions to diets and nutrition of many local peoples. Consumed as wild foods, NTFPs contribute directly to food security and nutrition: they make important contributions to micronutrient intake; are more important in times of food insecurity; and could help mitigate the nutrition transition.

While income generated through commercialization could theoretically make additional indirect contributions to food security and nutrition, recent reviews suggest that in many cases commercialization of NTFPs has not lived up to expectations, neither in terms of biodiversity conservation nor poverty alleviation. Moreover, a number of factors may limit the ability of increased income from commercialization of NTFPs to translate into improved food security and nutrition. For example, many studies have found commercialization to lead to reduced availability for local consumption. Income from commercialization may not be used to purchase alternative food items or purchased alternatives may be of inferior quality (potentially contributing to a nutrition transition).

Local responses to increased pressure on NTFP resources vary. In some cases overharvesting has resulted in efforts to domesticate species. However, as NTFPs become cash-crops there is risk that biodiversity within the agricultural ecosystem will be reduced. Reduced diversity within agricultural systems has been linked to increased vulnerability and food insecurity. Higher agricultural diversity has been associated with improved dietary diversity and micronutrient intake. Although commercialization may not be the win-win solution it was once thought to be, there is increasing evidence that subsistence use of culturally important wild food species can generate strong local commitment to sustainable resource use and lead to evolution of novel governance policies.

S34.OC.06

Opportunities and challenges in NTFP use, management, and conservation in the Brazilian Amazon

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The cultural intensity of non-timber forest product use in Brazil is high by forest-reliant communities, as well as by urban households who maintain strong culinary, medicnal and artistic use of forest goods. Two decades of research into valuable and vulnerable NTFPs in Brazil has highlighted both opportunities and challenges in NTFP use and conservation in the Brazilian context. Ecological and market research, driven by communities under pressure to sell timber, focused on the comparative value of locally valued NTFPs species and timber species. Rapid geo-political changes over the past few decades has altered both public perception of forests, the extent and compositon of forests and forest legislation. Results indicate that many widely used and traded NTFPs are logged for timber and many valuable NTFP species do not regenerate after logging and fire. Results also demonstrate that in areas with high market demand small holders have developed innovative management systems. Although some progressive regulatory changes at the state and federal level have favored non-timber forest product collectors, proposed changes to the forest code could unfavorably impact forest-reliant communities.

S34.P.01

Effect of Bark Collection on Population Structure of Enantia chloranta (syn Anninckia chloranta.) (oliv.) Setten & P.J.Maas in a Tropical Lowland Rainforest of Southwestern Nigeria

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Tree bark is an important non-timber forest product for the production of medicine, food and incense, yet effects of bark extraction on population of species have not been well studied. This study therefore, assessed the impact of bark harvesting on population structure of a high value medicinal plant, *Enantia chloranta (syn. Anninckia chloranta.*) in Shasha Forest Reserve, a tropical lowland rainforest ecosystem in southwest Nigeria. The aim of the study was to obtain an insight into the sustainability of harvesting and the future availability of the resource. Data were collected from eighteen belt transects of equal size (10×500 m) located in three different forest types namely; less disturbed natural forest, disturbed natural forest and plantation forest. Population status revealed plantation forest, disturbed natural forest and less disturbed natural forest contribute 24.09%, 31.33% and 44.58% respectively. The mean densities of the species range from 24.67/ha in less disturbed natural forest to 17.33/ha in disturbed natural forest and 13.33/ha in plantation forest. There was significant difference in both dbh and height size classes among forest types (dbh; $F = 52.488$, $df = 82$, $p= 0.0.05$ height; $F = 33.957$; $df = 74$, $p < 0.05$). Both the dbh and height size classes were higher in the plantation forest than in other sites within the reserve. More stands of the species were, however, represented in the 5.1cm – 10cm diameter class and the 5.0m – 14.9m height class. Our findings on the population structure are consistent with *apriori* expectation since the species is under serious pressures of exploitation for its bark, with more impact on the older tree stands. Although, the density of the species in plantation forest is less compared to other forest types, the area appears strategic to future availability of *E. chloranta* resource and sustainability of trade in its bark.

S34.P.02

Conservation status and abundance of the endemic palm Butia capitata (Mart.) Becc.: a Non Timber Forest Product of the Cerrado

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Ecological and anthropogenic gradients can provide essential information for natural resource management, especially about species occurring in ecosystems under intense and fast land use and management changes. Tropical palm trees have great potential to be a proxy to examine the relationship between habitat and population abundance, and the role of disturbance to population persistence. We investigate the population conservation status of the endemic palm *Butia capitata* (Mart.) Becc. under different disturbance intensities and the relative importance of ecological and anthropogenic gradients on abundance patterns. We used the skewness coefficient and the negative exponential adjustment to population size structures to describe, compare and infer conservation status. We used generalized linear models (GLM) and multiple hypotheses approach to investigate the relationship between ontogenetic life stages abundance and the ecological and anthropogenic gradient variables. Most populations under fruit harvesting pressure and extensive cattle raising have J-reversed size structure. Areas under more intense land use and management pressure have populations with nil or scarce regeneration. Soil fertility and texture play important roles in seedling abundance, and precipitation is important for juvenile abundance and should be considered in population restoration and conservation actions. Most of the present management and land uses practiced by traditional peoples and family farmers indicate that *B. capitata* self-regenerating populations may persist even in areas under multiple uses and its sustainable use may contribute to meet conservation strategy thru biodiversity use.

S34.P.03

The effects of land use, management and ecological gradients on population regeneration and density of *Caryocar brasiliense*, a neotropical savanna tree specie

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In areas under intense land use changes and land degradation plant populations will respond to ecological and anthropogenic gradients. These responses can be assessed in population size class distributions and life stages density, allowing the reconstruction of past regeneration dynamics and be used for decision making in management and conservation strategies. This approach is especially important for population species occurring under different land use and management pressures as *Caryocar brasiliense* Cambess, a tree of the Brazilian Cerrado (savanna). Its edible fruits are harvested and commercialized, playing an essential role in food security and income generation of traditional people and family farmers´ of the world's richest savanna. To assess the regeneration status of this tree, we fitted size class distribution models with negative exponential distributions and calculated the coefficient of skewness. To evaluate the association of anthropogenic and ecological effects to life stage density, we used generalized linear models with quasi-poisson and negative binomial distribution. All population size class distributions fitted to the reverse-J curve, but in more disturbed areas land use and management affected population size class distribution, reducing the fitting. Adult and juvenile densities of *C. brasiliense* are highest in the more fertile soils. The low intensity of fruit harvesting in most population in this region and cattle raising at low density amidst native vegetation did not affect seedling and sapling density life stages. The vegetation thinning reduced juvenile density, and enough time between thinning events should be allowed to the recovery of this slow growth species. Reducing fruit harvest pressure and ending or increasing vegetation thinning intervals should eventually allow population size class distribution to recover in the most disturbed areas. Fruit harvesting at current levels and cattle raising in low density were not detected as negative impacts for most populations persistence in the studied region.

S34.P.04

THE ECOLOGICAL EFFECTS OF HARVESTING NON-TIMBER FOREST PRODUCTS FROM NATURAL FORESTS: A REVIEW OF THE EVIDENCE

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The commercial trade of non-timber forest products (NTFPs) from natural forests has become a popular conservation strategy because it combines low-environmental-impact with an activity able to promote development among the inhabitants of natural areas. Accumulated evidence, however, has shown that harvesting can be associated with negative ecological effects. This study aimed to identify the most frequent ecological effects associated with NTFP harvesting. The analysis relied on a review of empirical studies searched in four databases, which were then evaluated against six criteria of inclusion. The studies that remained in the sample (n=60) were coded according to the category of NTFP exploited (e.g., fruit, seed, bark, among others) and the effects of harvesting to 15 parameters at different levels of ecological organisation (i.e., individual, population, community, ecosystem and landscape). The results indicated that negative ecological effects of NTFP harvesting are common, especially when leaves and bark are collected. At the level of the individual, alterations in organs (e.g., stems and leaves) and changes in survival rates were found to be recurrent effects of NTFP harvesting, especially when fruits or vegetative parts were collected. At the level of populations, the attributes of population size and population age structure were frequently affected by the exploitation of diverse types of NTFPs. At the level of community, the reduced number of previous empirical evaluations limits the reliability of possible inferences, but there is some evidence that the species richness in the area of collection may be affected by NTFP harvesting.

S34.P.05

Assessment of ecological potential for management of non-timber forest products in Central Amazonian floodplain forests

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It is estimated that 80% of people living in developing countries use non-timber forest products (NTFPs), and that their estimated value in the global market is US$ 18.5 billion. This study evaluates the potential for NTFPs management in the Central Amazonian floodplain forests. The main objectives were to select promising species for management and evaluate fruit yield, density, size class structure and spatial distribution of these species. From ethnobotanical survey conducted in eight communities in Mamirauá Reserve, Amazonas- Brazil, three species (*Euterpe precatoria*, *Attalea phalerata* and *Astrocaryum murumuru*) were indicated as the most promising for management activities. We randomly selected 25 reproductive individuals of each species at a distance of at least 100 m from each other; they had their bunches and fruits /seeds counted and weighed. To determine density, size class structure and distribution patterns of individuals ≥ 5 cm diameter at breast height (or ≥ 3 m in height for *A. murmuru and A. phalerata*) 18 transects of 1000 m X 10 m were established. The mean weight of fruits produced by *E. precatoria* was 24.5 kg and the mean weight of seeds produced by the oleaginous species *A. phalerata* and *A. murmuru* was 20.5 kg and 8.6 kg, respectively. Mean density of *E.precatoria*, *A. phalerata* and *A. murmuru* were 70.7, 43.0 and 36.2 trees ha^{-1}, respectively. Analysis of population structure revealed greater number of young and non-reproductive adult of *A. phalerata* and *A. murmuru*, but a greater number of reproductive adults of *E. precatoria*, and spatial distribution analysis (Ripley's K function) revealed that the three species have a tendency toward clumping. High densities and clumped distribution (better resource accessibility) are indices favorable for sustainable species management. These findings illustrate the potential for sustainable use of *E.precatoria*, *A. phalerata* and *A. murmuru* in Central Amazonian floodplain forests.

S34.P.06

Inter-annual variation in *Carapa guianensis* seed production: implications for the management of an important non-timber forest product

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Seeds of *Carapa guianensis* are recognized as an important non-timber forest product, used to obtain an oil that has medicinal and insect-repellent properties commonly used by local communities. The inconstancy in seed production, however, prevents its widespread economic use. To study the temporal variation of *Carapa* seed production, we established a 9-hectare permanent plot in a terra-firme forest located in northern Amazonia in the Brazilian state of Roraima. In this plot, we mapped, tagged, and measured a total of 134 *Carapa guianensis* trees. From 2006 to 2011 all trees were visited twice a month during the peak of the fruiting season (June-August) to quantify seed production. All seeds fallen beneath the crown of each individual tree were picked and weighted with a manual digital scale. During the six years of sampling, seed production presented a significant variation among years. Peaks of production were observed every two years (2008 and 2011). In years of low production, the maximum seed yield per tree was 63.9 kg, and in years of high production, the maximum number was 235.9 kg. Seed production was correlated with tree size. In general, *Carapa* trees are reproductive once they reach 20 cm in dbh, with a peak of fruit production observed between 60 and 70 cm in dbh. Trees in this size class represented 7% of all individuals, but produced 40% of all seeds in our plot. Trees over 70 cm in dbh showed a considerable reduction in seed production. Few individuals (6%) produced fruits/seeds every year. The most common pattern was fruiting every 2-3 years. Preliminary results suggest that climatic variables (rainfall) affect fruit production (low productivity and high seedling mortality were observed in an abnormally dry year, 2010). These potential negative effects create new challenges for local communities facing more recurrent extreme climatic events.

S35.OC.01

Tipping points of a neotropical forest: fire-drought interactions

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If climate change does cause the retreat or "dieback" of tropical forests due to increases in air temperature and decreases in precipitation, the direct agent of that dieback is likely to be fire. Extensive forest fires may become more common because dry-warm conditions promote fuel drying directly but also indirectly by killing trees and thinning forest canopies. Forest fires that do occur are also expected to be hotter, increasing both tree mortality and fuel combustion in ways that transfer large amounts of carbon to the atmosphere. To quantify the potential effects of this new fire regime on neotropical forests, we report a synthesis of results from a large-scale fire experiment and scale up our results regionally to similar forested areas across the Xingu Basin. Fire resistance was high during non-drought years, but exceptionally low when this forest was burned again during a drought event. As a result, annual mortality rates, canopy openness, and understory air temperatures increased, whereas carbon stocks dropped up to 62% compared to an unburned control. During the 2007 drought, 73% of the Xingu region experienced below-average precipitation and 9.5% of the region's forests burned (7,904 km^2). We conclude that dry-warm climatic conditions promote high-intensity, widespread fires that (i) reduce forest carbon stocks and (ii) increase the likelihood of subsequent "dangerous" fires. Landscape management should favor land uses that reduce fire probability.

S35.OC.02

Land use, climate, and fire activity in the Western Peruvian Amazon

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Fire links many aspects of climatic, demographic and land use change in the Amazon. Extensive fire has occurred during dry years in the past decade, leading to carbon emissions, property damage, and deterioration in air quality. We couple climate, remote sensing, national census, and farmer survey data to examine the biophysical and socioeconomic factors associated with fire incidence and frequency in the western Peruvian Amazon. We examine these relationships at two spatial scales: the entire region and a focused area around the town of Pucallpa where fire incidence has increased in the last decade. Basin-wide drought is the strongest predictor of fire activity at both scales. At the regional scale, fires occur in dry years where there is presence of ignition sources. Fire risk is also higher in areas with high rural outmigration. At the local scale, farmers use fire as a land management tool, but these fires are vulnerable to escaping into neighboring farms, oil palm plantations, and forest particularly during dry years. Place of origin and other demographics of farmers and landscape structure (e.g. farm density in surrounding landscape) are associated with the incidence and frequency of fires at this scale. Emerging understanding from this study of fire in the western Amazon highlights the large influence of extreme climate events, but also illustrates the role of land management practices in exacerbating or mitigating hindering fire activity.

S35.OC.03

Effect of hurricanes and land use on fire dynamics in Southern Yucatán, Mexico

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In the Mexican Yucatán forest fragments and biosphere reserves exist within a matrix of cattle pastures and slash-and-burn farming plots that are regularly burned. Ongoing deforestation and fragmentation leaves many remaining forest edges vulnerable to fire particularly during severe drought years. We explore the linkages between wildfire occurrence, frequency and severity and landscape characteristics including land-use, forest fragments, and hurricane damage in the four years following Hurricane Dean, an August 2007 Category-5 wind event. We examined the spatio-temporal behavior of all dry-season fire events from 2007 to 2011 using a combination of field records, official statistics and MODIS Active Fire data. Then we focus on three April-May (2011) wildfires that were ignited to clear cattle pastures, then escaped and spread quickly to the forest of the Calakmul Biosphere Reserve. A combination of plot-level burn severity data and pre- vs. post-fire Quickbird-2 imagery are used to map the burn severity and examine the linkages between severity, forest composition/configuration, and level of hurricane damage. Results reveal a three-year time lag between the hurricane event and abnormal levels of wildfire occurrence, in terms of spatial and temporal frequency. The dry-season of 2011 was the most wildfire prone season of the decade – the outcome of a prolonged five-year regional drought, desiccated wind thrown fuels, and ubiquitous fires for pasture maintenance along forest edges. The three 2011 caused stand-replacement in over 60% of the affected area, and likely a future 20% mortality in the remaining fragments. Burn severity was highest along forest edges that abutted pastures, which also sustained high levels of branch damage and uprooting during Hurricane Dean in 2007. Current conditions of ubiquitous wildfire ignitions, extensive land clearing for cattle pasture, fragmentation and damage to forests may combine to make large regions of the Yucatán vulnerable to fire conversion to early successional and impoverished conditions.

S35.OC.04

Effects of high frequency understory fires on early plant succession in southeastern Amazonian forests

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We examined the effects of single and three annual experimental burns on recruitment density, mode, and species richness (of stems with < 1 cm basal diameter). We conducted a 150-ha experimental burn, with a 50-ha control (B0), burned-once (B1), and thrice-burned plot (B3), to mimic low-intensity understory wildfires that move in from the forest edge. Stem density recovered within a year after a single burn, but did not recover after two and three annual burns. Further, after three annual burns, the majority (57%) of new recruits were resprouts (compared with 27% and 24% in the B1 and B0 plots, respectively). Moreover, species richness halved. Regeneration was dominated by a few species (one of which is also present in the *cerrado*, or Brazilian savanna) that were able to establish quickly via resprouting, but rare and fire-sensitive species disappeared. As Mato Grosso's agricultural frontier continues to expand, and brings high anthropogenic ignitions, repeat fires may alter early successional processes and thereby substantially hinder forest recovery.

S35.OC.05

Fire disturbance in Amazonian blackwater forests

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Despite having low human population, no mechanized logging and high average rainfall, floodplain forests of the Middle Rio Negro -- covering 7,700 km^2 along the main stem -- become flammable in anomalously dry years. We measured the damage from fire and the post-fire succession rate infered from a satelite derived vegetation index. We first used annual or bi-annual Landsat Thematic Mapper images to detect, delimit and obtain dates for floodplain forest fires in this region. Using high spatial resolution satellite images we measured the post-fire loss of forest cover in 36 of these burn scars, covering 873 ha. This damage estimate was validated in 15 burn scars using field inventories of surviving pre-fire trees. As a metric of post-fire succession, we used change in the Enhanced Vegetation Index (EVI), from the high temporal resolution MODIS sensor, between 2000 and 2011 in ten large burn scars caused by fires in 1998. To compare with succession rates in upland forest we used the same vegetation index in 12 fallows of slash-and-burn sites, from a time series of Landsat images.

Forest cover loss was high: 88% +/- 8% (average +/- 1 SD), with range 67-98%. Percent of trees killed by fire was also high: 91%, +/- 8%, range 75-100%. In the 15 fire scars where both types of forest damage measurements were made they were correlated, but not highly so (r = 0.7), given their narrow ranges. Forest recovery was very slow. EVI values typical of bare soil were still present 13 years after the fires, indicating a successional stage similar to the first year in upland slash-and-burn fallows. These results suggest a very low resistance and resilience of black-water forests to fire disturbance. More frequent fire events in a drier future could shift this forested ecosystem to a stable savanna-like state.

S35.OC.06

Congruence in indicator taxa and richness estimates: A study on biodiversity responses to fire disturbance in the Brazilian Amazon.

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Biodiversity is a vital component for the existence of functional natural habitats and effective conservation planning depends on reliable spatial information on its distribution. However, gathering extensive data on multiple species is a difficult task, due to logistical and financial constraints and lack of taxonomical expertise. A common resource to address this hurdle is the use of surrogate taxa: focusing in a limited set of species that provide information that can be extrapolated to wider patterns of biodiversity and ecological integrity. We test if richness relationships between ants, birds sampled with point counts, birds sampled with mist nets, dung beetles, trees and saplings will be consistent across four different biogeographical regions in the Brazilian Amazon. We also test if patterns of local congruence in richness and community composition are consistent in undisturbed forest, and gradients of forest disturbed by forest fires. Our results indicate that species richness at regional scale, across the field sites, were positively correlated in all pairs of taxa, except between ants and dung beetles, and birds with mist nets and dung beetles. At a local scale, richness and community composition in unburned forest showed virtually no correlation between the taxa, while the inclusion of samples form burned forest increased the number of significant correlations. Vegetation (trees and saplings) was the best indicator of overall community composition of all other taxa. Regional patterns of richness congruency are likely a consequence of macro variables such as climate and biogeographical history and have low power of extrapolation to local scales. Although the use of community composition metrics increased congruence at a local scale, we show the importance of using a broad ecological gradient.

S35.P.01

Post-fire regeneration of an invaded wet grassland in Brazilian Savanna

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Fire is a common disturbance in Brazilian Savannas and can alter the dynamics of plant communities, affecting the frequency and dominance of native or invasive species. The African grass *Melinis minutiflora* was introduced in Brazil in the XIX century and became one of the most serious invasive species of Brazilian savannas. The objective of this study was to evaluate the regeneration of *M. minutiflora* and of native herbaceous species after an accidental fire in a wet grassland vegetation type. The study was conducted at the Natural Reserve Serra do Tombador (Goiás, Brazil). Before fire, both native and invasive species were distributed throughout a moisture gradient: native species were found in drier areas, and populations of *M. minutiflora* were found in wetter areas covering approximately 100% of the area. After fire, five transects (22 m) were established along the gradient. We carried out vegetation surveys 40 and 120 days after fire, using 1x1m continuous plots along the transect. We measured the percentage of ground covered by *M.minutiflora*, native grasses, herbaceous dicots, dead biomass, and bare soil. For data analysis, we divided the transect in three parts: wet, transition and dry. Forty days after fire, regeneration of native grasses could be observed (25%) in wet and transition parts whilst invasive grasses regeneration was insignificant. Furthermore, in the wet part vegetation cover was very low. Regeneration of native grasses occurred along the entire gradient 120 days after the fire, including the wet part of the gradient However, the cover of *M. minutiflora* also increased and reached the transition areas. The cover of herbaceous dicots was low along the gradient. In conclusion, native species could establish after fire in areas previously invaded by exotic grasses in short-term and fire did not enhance the cover of *M. minutiflora*.

S35.P.02

PHOENIX PLANTS: EFFECTS OF FIRE ON HERBS REPRODUCTION OF A NEOTROPICAL SAVANNA

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Fire represents a set of synergistic factors that induces profuse flowering in Neotropical savanna. We conducted a field experiment with ten sympatric species of savanna herbs in Serra Azul Park, Brazil, to answer the questions: (1) Fire triggers flowering for all species selected? (2) Fire intensifies flowering? (3) What factors associated with fire (temperature, pruning, ethylene production, removal of vegetation, ash fertilization) trigger the occurrence of flowering? We included 540 randomly selected individuals in eight treatments plus control (six replicates per treatment). The treatments were done: around individual - 1st-burn vegetation; 2nd-cut vegetation; 3rd-cut vegetation and add ash (from organic matter removed and burnt), and in individuals - 4th-burn, 5th-pruning, 6th-pruning the individual and add ash, 7th-total burning; 8th-ethylene. The effects of treatments were evaluated for all 10 species and for each one separately. In the analysis by species, the proportion of plants that flowered after each treatment and control was compared using chi-square tests. In global analysis the proportion of plants that flowered and the number of inflorescences/individual (flowering intensity) was compared among treatments using Kruskal–Wallis tests, followed by multiple comparisons. We found that flowering was stimulated by fire but was not strictly fire-dependent. The fire induced flowering in 8 of the 10 species studied. Flowering was absent in control plants, and sparse in plants receiving single treatments. Ethylene, a gaseous component of the smoke, did not stimulate flowering in none of the species. The proportion of plants that formed flowers and the intensity of flowering were greater in the two treatments that involved the burning of the individual (individual burning and total burning). Our results indicate that flowering for each species is stimulated by a different factor produced by burning.

S35.P.03

Fire evolution and vegetation dynamics of savannas on Ibity Massif (Madagascar) using analysis and interpretation of satellite imagery

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Every year one-third of Madagascar goes up in flames. While fires are an integral part of many ecosystems, in this island nation natural ecosystems have been replaced by wide expanses of rice paddies and anthropological grasslands due to the extensive use of bush fires as a common agro-pastoral tool. Satellite images from MODIS products (MCD45A1) available since April 2000 were used to analyze the frequency of fire over a 10-year period. We identified the fire regimes practiced on Ibity, a new protected area situated 25km south of Antsirabe in central Madagascar. The synthesis of cartographic analyses from 2000 to 2010 show that: 1) there are three dry season fire modalities around and inside the protected area (early, late, and seasonal); 2) late fires are the most frequent; and 3) most fires occurred in the eastern and southern parts of the massif. Vegetation surveys show that: 1) increases in plant cover and species richness are correlated with increasing fire frequency; and 2) rocky outcrops, located above 1600m, probably play a key role as natural barrier against fires. This information will be integrated into vegetation management plans for the area.

Key words: fires frequency, protected area, Ibity, MODIS Burned Area Product, vegetation dynamic.

S35.P.04

What explains the poor regeneration of Amazonian blackwater forests after fire?

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Blackwater forests expand extensively across ~118.000 km^2 of Amazonian floodplains. Biodiversity is high despite overall poor nutrient conditions and annual floods that restrict plant growth. A thick root-mat contributes to efficient nutrient retention but acts also as fuel during drought periods, spreading wildfires. Post-fire tree cover loss is 88 %. Secondary succession after fire is slow, leaving open sites susceptible to re-burning for decades, which could potentially push these forests to a stable open savanna state. The mechanisms explaining secondary succession, however, remain practically unknown.

To assess the resilience of floodplain forests to fire, we studied the regenerating forest structure based on visual estimation (0-10), considering density and height of juvenile trees. Three potential limiting factors of forest succession were analyzed; fire scars age; length of annual flooding and availability of nearby adult trees. We studied 23 plots (250 x 10m) inside 15 burn scars spread across the middle Rio Negro floodplains. Scars were made by fires in 1992, 1995 and 1998 and ranged from 3 to 116 ha.

Our results show that the three variables together could explain only 28 % of the regeneration. The scars age had no effect on regeneration. The longer the annual length of flooding the lower the regeneration (P=0.01), whereas the larger the abundance of adult trees the larger the regeneration (P=0.1). However, when regeneration was analyzed at a finer scale (10 x 10 m), adult tree abundance had a strong negative exponential relationship, suggesting local competition between adult and recruiting trees. We hypothesize that the absence of a root-mat is limiting seedling establishment and survival, since it has been suggested to be vital for plant nutrition in such nutrient poor and constantly leached soils. We are currently studying the mechanisms explaining the resilience of blackwater forests to fire disturbance in the Amazon.

S35.P.05

Species regeneration in burned forest sites in the southern Amazon basin, Brazil.

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Understory wildfires have become more frequent and intense in several tropical forest regions. These wildfires can leave unknown changes in forest structure (*e.g.*, potential substitution by grasses and invasive savanna or scrub species). The present study aimed to investigate the effects of recurrent fire in understory regeneration, by testing the hypothesis that recurrent fires can replace forest species and favor savanna species. Experimental burns were conducted for six years in three 50-ha treatment plots (0.5x1.0 km) within a large tract of transitional forest in the southern Amazon basin. Plots included an unburned control (Plot-B0), a plot that burned three times in six years (Plot-B3), and a plot that burned annually for six consecutive years (Plot-B6). Ninety sub-plots (0.5x1.0 m) were installed in each plot, distributed at 0-50, 100, 250, 500 and 750 m from the edge. One year after the last burn in B6 and B3, we sampled, identified and classified all < 1cm DBH individuals into four groups: grasses, lianas, pioneer (P) and non-pioneer (NP) shrubs and trees species. Species richness and abundance in the NP group increased with distance from the edge only in plot B0 (unburned). Plot B3 (thrice-burned; at 50m of the edge) had higher abundance of NP species, mainly due to resprouting individuals of *Myrcia multiflora* (Lam.) DC. and *Marlierea umbraticola* (Kunth) O. Berg. However, both blocks B3 and B6 (six annual burns) showed higher abundance of lianas, species richness and abundance of pioneers. In the plots B3 and B6 grass species richness, and in plot B6 only grass abundance, increased near the edge, indicating positive grass response to disturbed environments. These results suggests that wildfires can make these sites more susceptible to colonization by grasses and lianas, which in turn can increase flammability and likelihood of fires with higher intensity, leading to forest impoverishment.

S35.P.06

Characterization of environmental and anthropogenic impacts in the Park Estadual de Moura Altamiro Pacheco in the year 2010 (Goiás).

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The Conservation Unit of Integral Protection State Park Altamiro Pacheco de Moura, located in central-southern Goiás State protects one of the last remnants of semideciduous forest, Cerrado Sensu stricto, Savanna and gallery forest. The decrease of the park area due to anthropogenic factors may be responsible for a major extinction of biota. Thus, we aimed to quantify the impacted area by the construction of Ribeirão Leite dam and also fires recorded in 2010 so that the datas can contribute to future works on management area. Were prepared shapefiles of João Leite stream basin on the edge of the park before and after dam construction using free LANDSAT-5 pictures from Arcgis software for 2009 and 2010 years. The identification of fire outbreaks in 2010 was made through the BDQUEIMADAS site (Database burned-INPE). The largest fire of 2010 was recorded in September and reached an area of 534 ha, near the BR-153 highway. The lake covers 271.6 ha of the park and about 70% of the area around the lake consists of pasture. Dam construction resulted in a transition for new wildlife habitats, displays to opportunistic predators and increased competition, as well the occupation of a large area that forced the migration of animals, has become a water barrier between the southern and northern Park area. An all-time monitoring and the local species survey are important for the species dynamism in the park, especially during the fires, once many will not be able migrate because of the dam construction.

Keywords: Enviromental Impacts, State Park, João Leite stream, burn.

S35.P.07

Fire selects autogamy in a treelet species in Cerrado: a case study in *Diplusodon oblongus* (Lythraceae) and *Styrax ferrugineus* (Styracaceae)

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The Cerrado is a vegetation mosaic resulting, in part, from its close relationship with fire. The plant species from Cerrado have adaptations that ensure its survival after fire events. But what are the reproductive consequences of fire occurrence in Cerrado? To answer this question five individuals of *Diplusodon oblongus* were selected in each of the fifteen plots from the Fire Project (PELD/CNPq) submitted to different fire management and distributed in physiognomies Campo sujo, Cerrado *sensu stricto* and Cerrado denso. Five individuals per plot of *Styrax ferrugineus* were also selected only in the Cerrado *sensu stricto*. To test the reproductive effect of fire, manual self-pollination and cross-pollination essays were performed. The results of these tests were used to calculate the index of self-incompatibility (ISI). The fire selected autogamous individuals in the shrub species, *D. oblongus*, depending on the physiognomies and frequency of fire. In contrast, populations of the tree species, *S. ferrugineus*, were not affected by fire. The lability of mating systems in flowering plants has been explained by factors related to differences in life histories of plants. The selection of autogamous individuals of *D. oblongus* could occur by favoring of autogamous visits by the variation in the density of individuals of *D. oblongus* or by the behavior and/or abundance of their pollinators after fire events, resulting in larger offspring for individuals more autogamous. In the absence of inbreeding depression, a higher establishment is expected when compared to a xenogamous offspring, due to automatic selection. This increase in reproductive success would allow the rapid establishment of autogamous populations. The great challenge now is to understand at what time the fire maximizes the selection of autogamous individuals of *D. oblongus* and which mechanisms are indeed responsible for this selection.

S35.P.08

Does fire affect ant community in the rupestrian fields?

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Despite evidence of natural fires, many studies link the human presence to increasing intensity and frequency of fire in the Cerrado. To monitor such impacts, ants have been use as bioindicators of fire disturbance. In September 2011, there was an intense fire in Serra do Cipó, area dominated by the speciose rupestrian field vegetation, an altitudinal quartizic formation known for its great biodiversity and endemism. We carried out an investigation on how ant community structure in the rupestrian fields was affected after the antropic fire. We hypothesized that ant species richness should be higher in unburned areas than in burned ones. Species composition was also predicted to vary due to the fire disturbance. We sampled ants at two scales: local (pitfall) and regional (transect). Two areas at distinct altitudes (800m and 1300 m) were selected, and at each one we selected an unburned and a burned plot. Three parallel transects of 250 m were outlined in each plot. In each transect, 5 pitfall traps were installed, with intervals of 50 m. Samples were taken one month after fire and found 119 ant species. Fire did not affect ant species richness or even the community composition when comparing unburned and burned areas, at all scales in both altitudes. We argue that the actual ant community present in rupestrian fields of Serra do Cipó is adapted to fire, as well as to the highly adapted life histories of some plants. The data also support the contention that fire has been a common phenomenon in this ecosystem and that ants are also adapted to it. Future studies on fire management in this speciose ecosystem have to be urgently developed to understand the impacts of more intense and more frequent fires caused by antropic activities. We thank FAPEMIG and CNPq for financial support.

S35.P.09

Post-fire regeneration of plant communities of campos rupestres, upland tropical grasslands in Brazil.

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The Cerrado (Brazilian savanna) is the second largest biome in Brazil, recovering 22% of the country, of which the *campos rupestres* are one of the most constraint physiognomies. The *campos rupestres* are upland tropical grasslands, characterized by shallow, acidic and nutrient-poor soils. Currently *campos rupestres* are threatened by land-use changes. While it is necessary to implement conservation and restoration projects, functioning of these ecosystems, including natural regeneration, remains poorly studied. The objective of this study was to assess natural regeneration after a fire (endogenous disturbance) of the two dominant physiognomies of the *campos rupestres* : the sandy grasslands (*campos arenosos*) and the stony grasslands (*campos pedregosos*). In each physiognomy, composition, density (number of individuals) and the percent cover of each species was assessed in 2009 (before fire), in October 2011 (two months after the fire) and in January 2012 (5 months after the fire) in 10 permanent $1m^2$ quadrats. Our results shows that five months after fire, species richness did not reach the initial values while vegetation cover in stony grasslands and density in sandy grasslands have similar value to those before fire. Our study highlights the great ability of *campo rupestre* herbaceous communities to regenerate after an endogenous perturbation, such as fire.

S35.P.10

SAFER HYDRAULIC CONDUCTIVITY, AND PROTECTION AGAINST FIRES ARE STRATEGIES OF CERRADO PLANTS

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Plants growing in the cerrado, or the Brazilian savanna, which is characterized by wet (October–April) and dry (May–September) seasons, have to adjust their morphophysiological traits seasonally to successfully cope with the soil water availability, and their external morphology against fires. The cerrado vegetation is a vertically structured mosaic of grassland, scrubland, and dense woodland physiognomies. The soils of these areas are deep, acidic, sandy, contain low levels of organic matter and phosphorus, and are rich in aluminum. Concomitant to seasonal water deficit, the cerrado environment experiences a high irradiance load and elevated vapor pressure deficits (VPD). Under such conditions, it is of great importance understanding the strategies used by the species to survive in this environment. For this proposal, we studied bark and wood from 91 shrubs and trees of 46 plant families of typical species from a protected area of cerrado of about 180 ha in Sao Paulo State, Brazil. The trends observed for bark surface were: furrowed and grooves (49%), rough (15%), in plates (14%), scaly (7%), in sheets (5%), smooth (3%), with disperse lenticels (2%), wrinkled (1%), with depressions (1%). Compared to mesic forest, the wood of cerrado plants have a strategy for safety under conditions of water stress reflected by higher values of multiple narrow vessels, high vessel frequency per mm^2, small intervessel pits alternate, vestured pits, simple perforation plates. The low vulnerability and mesomorphy indices reassert the greater safety under conditions of water stress. There were no differences among features when comparing trees and shrubs. The well-developed barks in the plants protect internal tissues against fires, and wood features demonstrate to be adapted to safer hydraulic conductivity in the cerrado.

S35.P.11

Bird functional diversity and wildfires in the Amazon forest

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Wildfires are becoming frequent in the Amazon forest. These fires modify bird species richness and abundance, but we know little about their effects on the functional structure of bird assemblages. We collated information about body mass, dietary and foraging traits to calculate the functional diversity of understory bird assemblages in Amazonian forests three years after the 1997-1998 El-Niño period, in which the forests had been under three disturbance levels: unburned, once-burned and twice-burned. We searched for differences in functional diversity among the three disturbance levels and whether these values were different from what one would expect by chance. Finally, we observed if habitat structure predicts the changes in the functional structure of the studied assemblages. In general, fire did not reduce functional diversity and did not select species more similar than expected by chance in relation to their ecological traits. Thus, bird functional structure was not different from random in any of the disturbance levels. These are evidences that neutral theories of biodiversity would explain the assembly of these communities. Nevertheless, we observed with the habitat structure analysis that birds from burned forests tended to be functionally more different (functional overdispersion), while birds from pristine forests tended to be functionally more similar than expected by chance (functional clustering). In conclusion, the environmental structure could be a better predictor of trait-based assembly rules of tropical birds than simple categorical definitions of burn frequency.

S36.OC.01

The effect of logging and silviculture on forest dynamics and biodiversity

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Sustainable forest management was proposed about 20 years ago as a conservation strategy for tropical forests. Although many ecological questions about the implementation of this strategy remain unanswered, ecological studies have largely focussed on showing the detrimental effects of conventional logging rather than in providing basic information needed to refine forest management practices. In this study I make use of several studies carried out in a moist semi-deciduous tropical forests in Bolivia to assess the effect of reduced-impact logging on biodiversity and forest dynamics. Data comes largely from the Long-term Silvicultural Research Program being carried out by the Bolivian Forest Research Institute, in which different logging treatments are applied to replicated 27-ha plots. Treatments vary in logging intensity and in intensity of silvicultural treatments (such as liberation from lianas and other competing trees). Results show that the effect of logging on species abundance and richness varies with the taxa considered (e.g., amphibians, understory birds, tree species) and with logging intensity. Silvicultural treatments enhance forest recovery, as growth and recruitment rates were higher in plots receiving the light and intensive silvicultural treatments (i.e., logging plus additional silvicultural treatments) than in the normal logging treatment (i.e., logging using reduced impact logging techniques). The changes in forest dynamics resulted in changes in the functional properties of the tree community (i.e., increases in community-weighted mean of specific leaf area and leaf nitrogen concentration, and decreases in wood density) but not in changes in species richness and the diversity of functional properties. These results suggest that not only reduced impact logging but also additional silvicultural are needed to enhance the recovery of logged forests. As ecological knowledge is key to define silvicultural treatment required to solve specific aspects, ecologists can play an important role in making logging activities ecologically more sound.

S36.OC.02

Long term Impact of logging on carbon storage and tree diversity in the Amazon Basin

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Currently, 350 million hectares of tropical moist forests worldwide are designated as production forests. Sustainable management of tropical forests for timber production has been proposed as a potential tool for the conservation of large areas of tropical forest. The key is to identify practices that promote repeated extraction of forest goods (timber and non timber forests products) without compromising important forest services such as biodiversity and carbon. However, Forest management guidelines applied in the Amazon basin are based on very general rules such as a unique minimum diameter cutting limit for all timber species and a rotation cycle of 30 years. These guidelines generally ignored the broad variation of forest types in the region. For example, the Amazon region shows a strong East-West gradient in both floristic composition and forest dynamics. This paper presents the results of the long term impact of logging on carbon storage and tree diversity in three different locations, one in French Guiana and two in the Brazilian Amazon. The main objectives are (i) to compare among the three sites the long term impact of logging intensities on forest dynamics and floristic composition, (ii) to propose research priorities to improve forest management guidelines so that they better reflect the gradient of forest types across the region.

S36.OC.03

The impacts of logging on carbon storage in SE Asia

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Carbon emissions related to logging are an important component of national GHG inventories in SE Asia. Experience with carbon offset projects in the region, combined with knowledge gained from ecological and silvicultural research informs our review of local impacts of logging on carbon storage and sequestration. Socio-economic factors are an important part of the carbon story, particularly at national and regional scales, for example, as they influence shifting baselines, the risk of conversion to non-forest uses, the interaction between legal and illegal logging operations and incidence of wildfire. Variability in logging practice, harvest intensity, post-harvest treatments and the ecological characteristics of the forest explain a large part of the variability in carbon dynamics at relatively small temporal and spatial scales. In this paper we discuss the impacts of logging on carbon emissions and sequestration at local and regional scales with an aim to identify key lessons learned from the region and priorities for future research.

S36.OC.04

Logging rules in tropical rainforests need considering the environmental context to limit their impact on biodiversity – Evidence from the CoForChange project in Central Africa

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Logging for timber provides significant income in many countries owning tropical forests, with about 235 millions m^3 logs extracted each year. In Central Africa, logging operations in the formal sector are regulated, and mainly occur within government granted concessions for which management plans are mandatory and felling cycles as well as minimum harvesting diameters are fixed by national forest codes.

Management plans are supposed to insure the sustainability of timber production and the long-term maintenance of all forest functions. The sustainability of timber production is usually estimated by calculating stock recovery rates, using fixed regional parameters of forest dynamics, which represents a real progress in tropical forests management practice. However, there is still place for improvement and further information should be taken into account: species composition of the stands, local environmental conditions, autecology of species, to adapt logging rules to the local context and limit the impacts on biodiversity.

The European funded project CoForChange gathered a multi-disciplinary team from 15 European and African institutions to undertake, in partnership with 11 timber companies, a large scale study covering about 6 millions ha of forests in Central Africa. The main objective was to understand how, why and where would tree species survive increasing pressure (drying climate, anthropogenic disturbance), and to provide diagnostic and decision-making tools to attenuate these effects on biodiversity. We evidenced the existence of at least four different forest types among the “mixed semi-deciduous rainforest”, differing in species composition and diversity, functional traits of species and structure of the stand mostly because of the geological substrate and the history of human disturbance. We also studied the response to light and drought in controlled experiments for the main tree species. Here, we discuss how the results of CoForChange should be considered to reason forest management and conservation strategies in Central Africa.

S36.OC.05

The effect of selective logging on genetic diversity of two Amazonian species with contrasting ecological and reproductive characteristics

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An important component of the Dendrogene project was the study of genetic structure, gene flow and reproductive biology of Amazonian timber species, before and after logging. Genetic data together with growth, regeneration and ecological data of the species are integrated in a simulation model analysis (Eco-gene), with different scenarios and intensities of logging, in order to evaluate outputs for supporting policies and and management practices to seek sustainable forest management and genetic resources conservation. This presentation focus on two Amazonian timber species [*Dipteryx odorata* (Leguminosae) tetraploid, and *Jacaranda copaia* (Bignoniaceae), diploid]. Genetic diversity and gene flow were characterized using hypervariable microsatellite markers before and after logging. Long-term genetic and demographic impacts (300 hundred years) were evaluated through simulations using the Eco-gene model. Overall, there were no short or long term impacts on this population of *J. copaia,* where current Brazilian forest management regulations are sustainable for both timber extraction and genetic diversity of the species. In contrast, *D. odorata* showed both short and long-term genetic and demographic impacts from selective logging. The removal of trees caused a 10% allele loss. Asynchrony of flowering could also limit the reproduction of *D. odorata* if the logged forest is fragmented with no connectivity between remnant forest patches. In the long term *D. odorata* will not cope with current Brazilian forest management practice. Increasing the minimum cutting diameter from 50 cm to 100 cm of dbh over a 30-year logging cycle, seems to be a recommended scenario for *D. odorata.* This work supports the idea that ecological and genetic information at species, ecological guild or reproductive group levels are essential in helping to derive sustainable management scenarios for tropical forests. Financial Support: Embrapa Amazônia Oriental/ABC/DFID e FINEP/MCT/CNPq, Clarendon Program (University of Oxford), Beca Program-IEB/Fundação Moore **e** Program Alβan.

S36.OC.06

Biodiversity soup, timber value, and the impacts of intensive logging

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Primary forest area is dwindling as selective logging sweeps across the tropics. Faced with such an economically lucrative activity, the conservation of large tracts of primary forest is extremely challenging. In contrast, the degraded forests that remain after selective logging and that now represent over half of lowland tropical forest area could offer a comparatively cheap avenue for biodiversity protection. Our research is based in the Sundaic rainforests of Southeast Asia, which are the forests most degraded by logging in the tropics and which probably represent a worst-case scenario for biodiversity within managed forests. In this talk, we first compare the rate of decline in biodiversity value—using birds and dung beetles as our proxies—with the rate of decline in timber value after logging. We then broaden our biodiversity horizons to evaluate the value of logged forests versus primary forests for ten invertebrate groups identified via the metabarcoding of biodiversity soup samples. Combined, our data reveal that as the remaining timber value declines, the biodiversity value of degraded forests persists at high levels. But could this high biodiversity value be explained by the export of individuals and species from primary to logged forests? We finally investigate the potential of source-sink dynamics to explain biodiversity retention and find no evidence of a decrease in the value of logged forest sites that are located further from unlogged forest edges. Combined, we conclude that logged forests harbour much biodiversity and that they represent a critical, but potentially cheap, addition to a network of increasingly isolated, protected primary forests.

S36.OC.08

Arrested succession of indigenous species in exotic tree plantations in a severely fragmented Afromontane landscape

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Plantations may contribute to biodiversity restoration through facilitation of indigenous forest succession in their understory, by enhancing tree seedling species diversity and abundance. To assess long term dynamics in such plantations, we tested the initial floristic composition hypothesis, which proposes a sequential floristic or life form dominance of species. For forests, the succession starts with early-successional species, comprising light-demanding, disturbance-tolerant or generalist species. Gradually, these species are replaced by late-successional species, including shade-tolerant, climax or specialist species. The tree regeneration under circa 50-year old plantations of five exotic species (*Acacia*, *Grevillea*, *Eucalyptus*, *Pinus* and *Cupressus*) was compared to generation in both small, disturbed and large, intact afromontane cloud forest fragments. In all plantation types, an increase in biodiversity and abundance of indigenous species was observed from the mature tree layer to the seedling layer. However, the dissimilarity between indigenous forest fragments and plantations remained high, even in the sapling and seedling layer, mainly because of the dominance of early-successional species in the regeneration. Arrested succession results in a disequilibrium between the regenerating species pool and the tree species pool at the landscape scale, which means that these plantations are marked by a high colonization credit. A low structural complexity of plantations, comprising low horizontal and vertical heterogeneity, undeveloped soil organic layer or impeded inter-specific facilitation, permits a lower number of establishment sites than indigenous forests with a heterogeneous complexity. In addition, tree harvest coupled with dead wood and fire have unfavourable effects on the recruitment of indigenous forest vegetation. Therefore, to stimulate further indigenous forest restoration of the plantations, it is essential to improve the structural quality after which enrichment planting can be considered.

S36.OC.09

Effects of selective logging on forest structure and tree diversity in two eastern coastal rain forests of Madagascar

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The effects of moderate and high-intensity non-mechanized selective tree harvesting (measured on three diameter classes for three native “focal” timber species) on forest structure and overall tree diversity were assessed in two coastal rain forests of eastern Madagascar (Antevialakoro and Tampolo) relative to a no/low harvesting baseline. All trees and cut stumps were inventoried in fourteen 0.25 ha plots that sampled a range of harvesting intensities, and all seedlings were inventoried in three 5 x 5m subplots within each 0.25 ha plot. 126 tree and seedling species and 89 cut stump species were recorded in the two forests combined. Relative to no/low harvesting (0 to 6 harvested focal species trees ha^{-1} per 40-year cutting cycle averaged over all three diameter classes), moderate intensity harvesting (2 to 9 harvested focal species trees ha^{-1} per 40-year cutting cycle) had a significant negative effect on overall tree basal area (BA) and overall tree seedling species richness (*S*), but no effect on tree density, overall adult tree *S*, or overall seedling or adult tree species diversity (*D*). High intensity harvesting (4 to 14 harvested focal species trees ha^{-1} per 40-year cutting cycle) had a significant negative effect on overall seedling and adult tree *S* and overall adult tree *D*, but no additional effect on BA or tree density. Our study’s moderate harvesting intensity was comparable to harvesting intensities proposed as sustainable in other studies of tropical tree harvesting; thus our results suggest that even harvesting intensities deemed sustainable for populations of tropical timber species (and thus potentially useful for the long-term conservation of those species in community-based forest management programs) may nevertheless have significant effects on some components of overall forest structure and tree diversity, and this could influence the long-term conservation of tropical forest ecosystems managed for sustainable timber production.

S36.OC.10

Dung beetles respond to selective logging and land-use change in the tropical lowlands of Sri Lanka: implications for conservation

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Tropical forest clearance and conversion severely impact native forest biota and are the primary causes of the current global biodiversity crisis. This study was conducted in 2008-2010, in the biodiversity hotspot Sri Lanka, which has lost 70% of its forest habitats due to logging, agriculture and other land uses. To assess the ecological impacts of this habitat disturbance, I compared communities of Scarabaeinae dung beetles and their dung removal function of primary forests with those of selectively logged forests, home gardens and tea plantations across the entire lowland wet zone of Sri Lanka. Dung beetles were sampled using 900 human faeces baited pitfall traps. A set of environmental variables was measured at each trap location to describe the habitats. Functional performance was measured as the mass of dung removed by beetles from dung piles provided prior to sampling. Generalized linear models were tested for the impacts of land use change on diversity and function, and the community changes were measured using non-parametric methods. Environmental determinants were identified with constrained correspondence and recursive partitioning analyses. Thirty four species of dung beetle were recorded and their abundance and the rate of dung removal decreased with anthropogenic land use. Community changes were reflected in altered functional group diversity. Community differences in forest and non-forest habitats were best explained by soil temperature, soil pH, and shrub cover. This study supplementing the limited knowledge on ecological effects of habitat disturbance in South Asia by highlighting an ecologically little known country in the region. The research findings identify dung beetles as a suitable indicator of habitat disturbance in Sri Lanka and can be used to make scientifically informed recommendations for the conservation of pristine forests and management of anthropogenic land use areas to increase their habitat value.

S36.OC.11

Timber offtake and selectivity in logging operations of northern Amazonia

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The increasing demand for timber products and resulting growth in logging activities in raises serious concerns over the fate of tropical forests worldwide. Deforestation and timber overharvesting in Asia and Africa has turned the focus of roundlog extraction to Amazonian forests, where large tracts of relatively pristine forest areas are still available. Because selective logging is increasing in Amazonia, it is necessary to understand the profile of timber species exploited and how this affects the aboveground forest biomass removed by logging. We studied selective logging operations within the state of Amapá, which exhibits the lowest deforestation rate in Brazil. We obtained data on offtake volumes per species are from forest management licenses approved by both federal and states agencies. We focused on the five most productive canopy tree species: *Dinizia excelsa*, *Manilkara huberi*, *Dipteryx odorata*, *Goupia glaba* and *Ocotea rubra*, which accounted for 67% of the total volume harvested from 245 timber species between 2003 and 2011. The total biomass harvested in this period was 384,156Mkg/m^3. *D. excelsa* and *M. huberi* were the two most harvested species, representing three quarters of the biomass of five top-ranking commercially valuable species. These results show that the timber industry in Amapá is highly selective and that timber harvest concentrates on heavy-wooded tree species (i.e. ranging from 641 to 1090 kg/m^3).Therefore, Amapá contributes with a significant removal of the forest biomass in Brazilian Amazonia, even though a relatively small proportion of its total area is suitable for financially viable logging operations.

S36.OC.12

Distribution of hollow trees in forest managed for timber in eastern Amazonia

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The distribution of trees with stem hollows or rotten cores affects forest management in both ecological and economic perspectives. While retaining hollow trees helps conserve species that use the hollows as nesting sites, felled hollow trees, or parts of them, are usually abandoned in the forest, reducing logging profits and increasing forest flammability. Using data from inventoried stands in a naturally regenerated tropical forest managed for timber in the eastern Amazon, I investigated how the characteristics of economically important timber tree species influenced their susceptibility to decay. The 38 tree species with ≥ 200 individuals in a sampled area of 2113 ha were included in this analysis. Logistic tree-level models were used to predict the presence or absence of cavities in individual trees based on its DBH, wood density (WD) by species, and density of trees >45 cm DBH in a 10 m radius area surrounding each focal tree. Post-logging data available for 300 ha were used to investigate the presence of heartwood hollows or rotten cores in trees of the six most abundant species selected for harvesting (i.e., with no obvious cavities). Logistic models were used to test the predictive variables mentioned previously. Tree species with higher wood density were more prone to have heartwood cavities with open holes on the exterior of the trunk. Additionally, the proportion of trees with such stem cavities decreased with tree diameter. In contrast, for trees with no external openings in which hollows and rotten cores were only detected after felling there was a positive relationship between a tree's size and its likelihood of being hollow. The complimentary results indicate that trees with open hollows may be more susceptible to fail than trees that have hollows restricted to the heartwood.

S36.P.02

Seedling survival of four tropical timber species near conspecific adults: management implications

Gonzalez A

Nowadays, tropical forestry in increasingly focused on natural regeneration management for sustainable timber harvesting from natural forests. In this sense, seedling performance near conspecifics adults is a critical factor to understand seedling dynamics and to apply techniques to increase regeneration of high valuable timber species. However, in tropical regions few timber management plans take into account implications of seedling performance close to conspecific adults on regeneration management. In this study, I analyzed seedling survival close to conspecific adults of four tropical timber species (*Brosimum utile, Carapa guianensis, Tapirira guianensis* and *Virola sebifera*) based on two census data (4-year period) of a 6-ha plot at the Panama Canal and applying spatial statistics methods. While *B. utile* showed repulsion between seedlings and adults at radius distance of 0-25 and 45-65 m, seedlings and adults of other three species had attraction at short (0-15 m) and medium(20-40 m) distances. These results show that seedling survival of *B. utile* decreases near conspecific adults, probably due to density-dependence effects and/or competition for light and nutrients. On the other hand, these findings also indicate that seedling survival of *C. guianensis, T. guianensis* and *V. sebifera* increases close to conspecific adults or at intermediate distances, which suggests that microsites around conspecific adults were favorable to seedlings performance as well as that competition and density-dependent effects played a limited role in seedling survival of these species. These results would be useful to design sivicultural strategies that seek to maintain commercial productivity of logged forests by procedures to enhance seedling survival of the study species such as enrichment planting, seedling transplanting, liberation thinning and other intermediate practices.

S36.P.03

Dynamics of the diameter distribution of a logged forest in Brazilian Amazon

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The Amazon rainforest is undeniably an abundant source of biological diversity, its natural resources have a high economic potential that is used, sustainably or not, by different groups in society. This study verified the 30 years dynamics of the diameter distribution of a logged forest. The study area is the Km67 site of the Tapajos National Forest near to the road BR163. The dominant type of forest is the Ombrophilous Dense Forest of Terra-Firme with a history of selective logging of four species prior to the establishment of the experiment. In 1979 the area was logged under two different treatments based at the Minimum Diameter Cutting of 45 and 55cm. 64 commercial species were harvested, the accumulated stemwood volume was about $72m^3ha^{-1}$. The diameter distribution was constructed using nine classes with amplitude of 10cm, the minimum diameter was 5cm. Over 30 years of monitoring the diameter distribution showed a continued reverse J-shaped curve. Eight years after logging the diameter classes below 25cm, of the two treatments, recovered their initial densities, at the present they showed a deficit of 15% of individuals. Classes between 25 and 45cm surprisingly recovered their densities two years after logging, currently they cumulates a density 170% higher than the original. Diameter classes between 45 and 85 cm observed after logging an immediately reduction of them density by 41%, but at the end of the cycle of 30 years they recovered at the basis of 140% them densities. Class above 85 cm is still showing a deficit of 53% of its individuals. The high accumulation of individuals in the intermediate classes and the deficit observed at the first diameter classes has as consequence the emergence of a diameter distribution characterized by a constant "q" value (balanced) between classes 15-65 cm, contrasting from that observed before logging.

S36.P.04

Phytosociological structure of an intensively logged forest in the Amazonian, Brazil.

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The study area belongs to the dense rain forest of terra-firme, located in Dom Eliseu in southeast State of Pará, Brazil. The 535ha forest area is considered a “Reserva Legal” area, under the Brazilian Forest Code and was repeatedly logged in the past. In the present we evaluated its timber stock in order to managed its structure to promote its conservation. The floristic inventory evaluated all trees species with DBH ≥ 5 cm in 50 permanent plots (50x50m), totaling 12.5 ha sampling area. The gaps, created by the last intervention (2004), were enriched with *Schizolobium parahyba var. amazonicum*. We observed a high specie richness (> 400 species), high population density (1,271.4 trees ha^{-1}) and a basal area of 22.8m² ha^{-1}. Additionally was observed that trees under 35 cm dbh represent 96.6% of the total individuals and 66.5% of total basal area. These results show the high intensity of exploitation that occurred in the past and initial recover stage of the forest, characterized by the predominance of the pioneer species, such as of genus Cecropia pioneer species (*C. palmata, C. sciadophylla, C. distachia, C. obtusa*) and the heliophyla planted *S. parahyba var. amazonicum* species, which occupy 11.1% and 2.5% of tree density and 15.2% and 11.6% of basal area of the forest community respectively. Therefore, we observed that the remanescent timber stock of the forest is composed of a rich species diversity and trees of small diameter, and finally, a typical dominance of pioneer species.

Keywords: Amazonian tropical forest, intensive logging. timber storage, pioneer species

S36.P.05

Incompatibility Systems and Pollination of Amazonian Trees

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Abstract

Mating system of tropical plants is mainly regulated by incompatibility to self-pollen. Modes of self-incompatibility are represented basically by Sporophytic self-incompatibility (SSI), Gametophytic self-incompatibility (GSI), Heteromorphic self-incompatibility (HetSI) and Late acting self-incompatibility (LSI). We studied the reproductive system of native Amazonian timber trees, as follows: *Jacaranda copaia* (Aubl.) D. Don (Bignoniaceae), *Dipteryx odorata* (Aubl.) Willd. (Leg-Papilionoideae), *Carapa guianensis* Aubl. (Meliaceae) and *Bertholletia excelsa* Humb. & Bonpl. (Lecythidaceae). These species are hardwood trees used in the forestry industry, but *B. excelsa* is protected by the Brazilian environmental legislation, due to its ecological importance and non-forestry product use. The studies were conducted in the Western Amazon (Pará State), North of Brazil, in dense ombrophilous forest and cultivated fields. We studied the pollination and reproductive systems, in order to characterize the incompatibility systems of these plants and main pollinators. Controlled pollination tests were accomplished in isolated flowers of each species. Pollinated pistils were fixed in FAA after 48 h, softened in NaOH 8M solution and prepared with Aniline Blue to visualize pollen tube growth under epifluorescence microscope (excitation wave length 450-490 nm). Floral visitors were surveyed, collected, prepared and identified according to their behavior as effective or occasional pollinators, or pollen/nectar robbers. The analysis of controlled pollination tests revealed that all the species are mainly allogamous, thus dependent on pollinators to mediate pollen transfer among individual plants. Three major SI systems were recorded: LSI in *J. copaia* and *D. odorata*, and, apparently, SSI in *C. guianensis*; and GSI in *B. excelsa*. In terms of pollinator activity, *J. copaia* was visited by small bees (e.g. *Centris*, *Euglossa*), *D. odorata* and *B. excelsa* by large bees (e.g. *Xylocopa*, *Epicharis*, *Bombus* and *Eulaema*), *C. guianensis* by microlepidopterans (Riodinidae and Lycaenidae) and stingless bees (Meliponina).

S36.P.06

Impacts of logging on fungi communities associated with coarse woody debris in eastern Amazonia

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By enhancing volumes and changing the distribution of coarse woody debris (CWD) on forest floor, selective logging affects the dynamics and composition of decay fungi communities associated to it. I used a transect-based survey to evaluate the effects of logging on the diversity of polypore fungi inhabiting CWD in a tropical forest in eastern Amazonia, Brazil. CWD marked in a forest to be selectively logged and in an adjacent control forest (225 and 216 samples respectively) were examined for fungal fruiting bodies once before logging and twice at a 5 mo intervals afterwards. A total of 187 specimens of 52 fungal species were recorded, but 42% of species were recorded only once. The number of fungal species recorded by sample of CWD in the logged and control plot varied differently through time, decreasing rapidly in the logged forest. Fungal species richness was influenced by CWD diameter, decay class, and substrate type (fallen log or standing dead tree). As canopy cover recovers and CWD discarded during logging operations decays, fungal species diversity is expected to increase.

S36.P.07

Impact of timber exploitation in the genetic diversity and demography of Manilkara huberi (Ducke) A.Chev: generation of indicators for sustainable management

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Amazon tropical forest has experienced high rates of deforestation in the last decades. This forest represents an invaluable heritage of several countries and its diversity of ecosystems hosts an infinity of plants. Due to this high diversity, policies focus on reducing impacts on the management for a given forestry product are difficult to evaluate and measure. This project aimed to evaluate the consequences of timber exploitation in one of the most exploited timber trees, *Manilkara huberi*. Microsatellite markers showed high levels of polymorphism. For adults, juveniles and seeds (pre-logging) the following values were obtained: He=0.867, 0.840, 0.811, respectively. The fixation indexes for the three generations were all different from zero (*f*= 0.221, 0.303 and 0.237), although not statistically different between each other (95% CI). After logging, the fixation index in the seedling generation was significantly reduced (f=0.069). Logging led to the loss of 11,6% of the total amount of alleles. The significant spatial genetic structure observed at the unexplored population (450m) was not detected after exploitation. The same result was observed for the commercial individuals. Eco-gene simulation model was used to evaluate the long-term impact in genetic diversity and demography. Several scenarios (13), combining different cutting diameters (45, 55 and 65 cm dbh), cycles (30, 60 and 90 years) and residual amount of adult trees (10, 30 and 50%) were tested. At the end of the simulated period the basal area was strongly reduced under all conditions. In only one scenario the species was able to recover its basal area following logging (90 years cycle). The species also showed a loss of alleles and genotypes and an increased genetic distance. However, effective number of alleles, expected and observed heterozygosities, and the fixation index were little affected by the logging simulations. It becomes clear the importance of knowledge regarding the biology of the species in order to define efficient management programs.

S36.P.08

Effects of reduced-impact logging on aquatic insects associated with submerged woody debris in Central Amazonian streams.

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Reduced-impact logging is a promising alternative land use because reduce damage to forest cover in comparison to clear-cut practices. However, this management could affect wood availability and quality of submerged woody debris, affecting structure and composition of aquatic communities associated with these substrata. In this study, we evaluated if community of aquatic insects associated with submerged woody debris respond predictably to forest management in a certified commercial-logging in Central Amazonian streams. We expected that reduced-impact logging would affect structure and composition of the community of insects associated with submerged woody debris. We selected six streams which are in management forest areas and six in reference areas. For each stream, we manually collected 4,3 dm^3 of submerged woody debris, according to the presence of hollows, biofilm and size of 5 to 8cm and 30cm length. We used t test to verify if total abundance and richness of aquatic insects differ among streams in reference and reduced-impact logging areas and PERMANOVA for test possible difference in composition. We found 488 aquatic insects associated with submerged woody debris belonging to 31 taxa. Our results show that reduced-impact logging do not affect aquatic insects associated with submerged woody debris ($t_{abundance}$=0.4, p>0.05; $t_{richness}$=0.04, p>0.05; PERMANOVA, F=0.84, p>0.05). Reduced-impact logging probably had minimal impact in wood availability in streams, i.e., there are enough substrata for the maintenance of this community. Thus, controlled logging, such as applied in Central Amazonian streams, open new perspective for insect conservation and commercial exploration of wood, which is not possible when clear-cut practices is adopted.

S37.OC.01

Conservation of frankincense forests in Ethiopia needs integration of social and natural sciences.

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Dry forests in the tropics are under serious threat, not in the least because in many cases alternative landuses provide more economic benefits and higher household incomes. Conservation of these forests and the environmental services they provide need efforts where forest-based knowledge and conservation activities are closely integrated with people-focused analyses, viewpoints and actions. One-sided efforts are doomed to fail.
I will give an example from the Horn of Africa, where forests dominated by Boswellia trees that provide frankincense, a resin traded for millennia, are under serious threat. Conversion to agricultural land, cattle grazing, fire and intensive exploitation for wood, fodder and frankincense lead to decimation of forests and of the frankincense production within decades. The multidisciplinary FRAME project develops possibilities for more sustainable use and management of frankincense trees and their forests.
Our natural science studies show that frankincense tree populations are declining fast: there is no regeneration and adult trees have high mortality rates. Frankincense production will therefor decrease fast. The forests will be dominated by other, better regenerating species in the near future. Climate change may aggravate the situation.
Our social science studies show that frankincense production management strategies are diverse and depend on the region, local culture and customs, and alternatives for livelihoods. Laws and regulations of frankincense forest management and use are generally poorly respected; local power relations override national and regional instructions. Forests are converted to agricultural land by individual farmers and by large scale investors, but in some areas local people rely heavily on frankincense for household income. Sesame and cotton are believed to give higher economic returns, but our analyses show that this may not be the case.
I will show that both types of knowledge are needed to provide solution pathways that may sustain both forests and people in the future.

S37.OC.02

Interdisciplinary studies on ecosystem services

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Interdisciplinary approaches are increasingly been used in the search for alternatives to understand the dynamics of the ecological and social systems as well as their interactions through ecosystem management and the delivery of ecosystem services. Such interdisciplinary approaches are needed to assess what are the social and ecological drivers that underpin management decisions, how they change in response to particular biophysical and social context, and how they underpin the delivery of ecosystem services. In this work we address three different aspects associated to such interdisciplinary projects. We first discuss the importance of conceptual frameworks to guide these research approaches. We present an *ad-hoc* framework developed for a watershed in western Mexico in which we show that services are the result of the interactions between ecosystem components and processes and societies. Then we discuss the importance of developing interdisciplinary spatial frameworks to guide decision- making. We present a spatial interdisciplinary framework developed at the national scale for Mexico, the socio-ecoregions. We show how socio-ecoregions can be used to explore the relative contributions of social and ecological drivers to service delivery. Finally, we discuss the need to undertake comparative interdisciplinary research on ecosystem services for multiple biophysical and social contexts. We present a global initiative that has been created for that purpose, the Program on Ecosystem Change and Society, which will emphasize placed-based research on the policies and technologies that can contribute to the sustainable provision of a portfolio of ecosystem services. We finalize by discussing how the interdisciplinary research frameworks, the interdisciplinary spatial frameworks, and a research initiative linking multiple sites undertaking interdisciplinary research can contribute to the conservation of tropical systems

S37.OC.03

Perceptions, behaviour and environmental conservation in Malawi

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Malawi is one of the poorest countries in the world and has experienced high levels of poverty, food insecurity and environmental degradation. High population pressures have increased farming intensity and triggered agricultural expansion, which is contributing to deforestation. Understanding the socio-economic drivers of environmental degradation and the decision making process of farmers involved in using forest resources and in tree planting activities is crucial to address these issues. This study examines the perceptions and behaviour of subsistence farmers in Malawi in relation to tree cover, forest usage and tree planting activities. Household questionnaires were used in two study regions in Malawi: the northern district Mzimba and the southern district Chiradzulu. In each district, 100 farmers were interviewed about their perceptions and practices in relation to planting trees and tree cover in the area.

Farmers in the south have different perceptions of tree cover and loss compared to those in the north. Most of the farmers in the north say that there is a natural forest near their village, but also say that deforestation levels are high, mainly due to charcoal production, firewood collection and brick burning. In the south, most farmers say that currently tree cover is low and that forests have disappeared because the land was cleared for agriculture, house construction and firewood collection. Most of the farmers in the sample are involved in tree planting activities to a certain extent, and the number of trees planted on farm is higher when farmers perceive tree cover in the area to be low. There are clear differences in motivations for and practices of tree planting between the two sites. This study shows that there is a relationship between environmental perceptions and the incentive to participate in conservation activities such as tree planting in Malawi.

S37.OC.04

Do mythical dragons, dancing animals, and nature spirits prevent deforestation? Case studies in the Gambia, West Africa, and Sabah, Malaysian Borneo

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Purpose In the matrix of land use beyond protected areas, cultural practices "informally" conserve forest patches, rivers, and water catchments. Highlighting case studies in the Gambia, West Africa, and Sabah, Malaysian Borneo, this presentation explores how mythical dragons, dancing animals, and nature spirits prevent deforestation in their respective landscapes.

Methods Fieldwork was performed in Kiang West, the Gambia, from June to August 2009 and in Sabah, Malaysian Borneo, from October 2010 to April 2011. GPS coordinates of customary conserved areas were recorded and oral and written questionnaires, participant observation, and key informant interviews were conducted. The Normalized Difference Vegetation Index (NDVI) was calculated for seven October/November Landsat satellite images of the Gambia (30m resolution) from 1984-2009. The NDVI or "greenness" of areas where dragons are believed to inhabit was compared with formally conserved areas over the 25-year period.

Results Fifteen *ninkananko*, or mythical dragons, reportedly inhabit patches of forest; if someone sees a *ninkananka*, he dies soon after. Analysis of the NDVI of dragon areas revealed that dragon areas were "greener" with greater consistency compared with three formally protected forest reserves and a national park over the 25-year period. In Sabah, Malaysian Borneo, Rungus communities believed that dancing animals protected the forest on top of Gumantong hill. Although Iban headhunters killed the dancing animals, the Rungus continue to conserve the forest. Kadazan-Dusun communities in Sook have used the prohibitions of a *bobohizan* (traditional healer) as a force of resistance against a Chinese company clearing their customary land.

Conclusion Customary conservation, prevalent in the tropics, can add conservation value in the matrix beyond protected areas. However, cultural beliefs and practices evolve; thus "informal" customary conservation requires recognition and support to maintain conservation value in the face of social change. An Oxford database project maps customary conservation and assesses conservation value.

S37.OC.06

The ecosystem assessment approach: Narrowing the gap between science and policy

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Humans have extensively altered the global environment, to such point that is has been recognized that we are experiencing a new era in planetary history, the "Anthropocene", with the sixth mass extinction under way. Even though the development and cultural evolution of mankind has depended upon services provided by the biosphere and its ecosystems, most decisions of the stakeholder and policy community are still being taken without balancing the negative impacts on the environment, focusing only on the short term economic and social benefits. A common argument is that there is not sufficient scientific information to estimate the potential risk to biodiversity and its role in providing goods and services for human well-being, in addition to the difficulty to understand scientific uncertainty. Ecosystem assessments have recently been undertaken at the global and national level with the intent to reach a wider public and provide the scientific basis to call for action of all sectors of society to conserve and sustainably use the world´s ecosystems. In this work we examine some of the key messages delivered by Mexico´s ecosystem assessment (*Natural Capital of Mexico*) in order to influence decision-making and discuss the conceptual framework needed to narrow the gap between science and policy. We conclude that it is necessary to translate and transfer knowledge in a dynamic process and identify research questions in the science and policy domain, in order to continuously base decisions on the best available information. Society in general needs to fully recognize the value of nature for its own well-being, and push towards a cross-cutting environmental policy. An ambitious interdisciplinary research effort is needed, as well as better communication mechanisms between scientist, society and policy makers in order to reach more effective and sound natural resource management decisions.

S37.P.01

Threats of Urbanisation to Indigenous Biological Diversity: Assessment of impacts on the remaining Iroko (Milicial excelsa Welw C.C. Berg.) in Ibadan, Oyo State, Nigeria

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Settlements and sprawl development are becoming large active land use changes and this is causing destruction of remaining indigenous plant species, most especially in developing countries. *Milicia excelsa* (formerly *Chlorophora excelsa*) commercially known as Iroko, is a valuable timber tree species with social, economic and cultural significances. However, the International Union for Conservation of Nature (IUCN) Red Data List has listed *M. excelsa* as “near threatened” and one of the endangered valuable timber species. Some of the threats to the species include timber extraction and urbanisation process. Ibadan is considered as the largest indigenous city in West Africa, located in the South-west region of Nigeria. Historians put it that Ibadan was established in the forest region with rich biological diversities. It is unfortunate to note that the land is fast losing its biological diversities as a result of urbanisation. The study is therefore a survey of the remaining stands of *M. excelsa* in the city. Semi-structured questionnaire were also administered to the people living or working in the locations to determine the utilisations and impacts on the tree species. A total of 62 stands of *M. excelsa* were sighted, but only 33 could be accessed, while the remaining 29 were inaccessible. The density of the remaining of Iroko in Ibadan is approx. 0.003 adult tree/km^2. Larger percentage of the remaining few of the trees species currently exist in the academic and research institutes located in Ibadan. Vast number of Iroko in residential areas and other parts of Ibadan has been removed leaving scatter trees coping to survive. The socio-economic significances of Iroko trees in their locations were grouped into five categories, which include Environmental services (provision of shade from direct sunlight), medicinal (parts used for treatments of sicknesses and illnesses), economic (sales of the barks and use of fallen branches as fuelwood), spiritual (medium for offering of sacrifices and fetish activities), and ecological (habitat for birds and phorophytes for orchids and other epiphytes). Although majority of the respondents did not support felling of the tree, however the strategy for their conservation as urban tree and protection against damage to life and property is pertinent. Policy to protect indiscriminate felling of trees in the city should be put in place while management strategy in the form of appropriate and constant monitoring of the tree status for any sign of weakness should be put in place.

S37.P.02

How much worth is a jaguar alive? Alternatives to conflicts between livestock and large cats in the Brazilian Pantanal

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Jaguars (Panthera onca) are the largest carnivores from Brazil and the Pantanal floodplains are considered one of the last strongholds for the species. Even though Pantanal is one of the most visited places in the world for wildlife observation, and jaguars figures first among the most wanted list, there is still a great deal of illegal killing due to conflicts with domestic livestock. Because of this, the majority of research dealing with this issue focus on decreasing the impacts of jaguars on domestic animals, either by improving cattle management or by implementing strategies to avoid attacks. Here we present results from five years (2005-2009) of collecting data on livestock killings and tourist visiting at one site at the southern Brazilian Pantanal to show that jaguar observation activities can generate more income than the losses caused by livestock attacks. The study area is a 140km^2 ranch located at the Brazilian Pantanal, where besides traditional ranching there is also tourism activities related to wildlife observation. The ranch has maintained an annual average of 3,900 head of cattle between 2005 and 2009, during which there were 44 confirmed jaguar attacks on cattle, resulting in a financial damage of c. US$ 18,500. During the same period, the ranch has received almost 12,000 people to take the night tour which focuses the search for jaguars and other nocturnal animals. These visitors spent in this tour alone c. US$ 500,000 although only around 2,900 (24%) actually saw jaguars during that activity. These figures show that live jaguars can yield some 25 times more income than the damage caused with livestock killing. It also shows that for the activity to be successful, it does not necessarily need that every person sees the cat, but rather that only part of them do it. This real chance of seeing the animal in turn enhances the expectations of the others what would make the activity long lasting. However, for tourism activities to become an important alternative to generate income to traditional ranches in the Pantanal, ranchers will have to preserve the landscape and the wildlife that tourists are seeking for.

S37.P.03

Conflicts between traditional populations and parks in a Tropical Dry Forest region of Brazil: are conservation units of restricted use effective for conservation?

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This study aimed to analyze the social-environmental conflicts that emerged in the last decade in the north of Minas Gerais state, in southeastern Brazil, as a consequence of the creation of several conservation units (CUs) of restricted use (equivalent to IUCN's categories Ia, II and III) in a region of Tropical Dry Forests. We used documental research, policy analyses and semi-structured interviews to demonstrate that the different actors interpret tropical dry forests alternately as economic, natural or territorial assets. As a compensation policy for the establishment and expansion of a large irrigation project, the State government delimited approximately 75,000 hectares at five CUs of restricted use concentrated in three municipalities. However, this region has a high density of traditional populations, especially slave-descendents ("quilombolas") and dwellers of the São Francisco river margins ("vazanteiros"). Most of these CUs were established in the late 1990's over their ancestral territories, limiting their subsistence capability and jeopardizing their food security. Several other actors are involved in such dispute, including environmentalists, rural sectors, the federal and state governments and non-governmental organizations, with distinct perspectives, interests and power relations regarding this dry forest territory. Recently, the tensions generated by such conflicts escalated to park invasions, forcing the government to started negotiations to review the current limits of CUs. However, the traditional populations claim for a change in the CUs status from restricted to sustainable use (IUCN category VI), allowing their communal land use in these areas. In general, such conflicts significantly decrease the effective of CUs of restricted use for biodiversity conservation, and their delimitation must be subject of rigorous studies and public consultation. Ultimately, development and conservation policies for this region and Brazilian tropical dry forests as a whole should go beyond the dichotomy between large economic projects versus preservation of human-free protected areas.

S37.P.04

Belief Systems, Land Tenure and Customary Conservation in Malaysian Borneo

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Purpose Malaysia, one of five biologically megadiverse countries in Asia, has formally protected 8.5% of its land surface and 2% of its territorial waters. Indigenous groups comprise 66% of the population of Sabah, Malaysian Borneo, and although less than one percent of Sabahans are classified as Animists, nature spirits, *adat* (customary law), and *tagal* (prohibitions) are prevalent in the matrix of land use beyond formally protected areas. This research assesses the resilience of customary conservation in Sabah in the face of drivers of change and considers the feasibility of integrating customary conservation with the formal conservation framework.

Methods Fieldwork was performed in Sabah, Malaysian Borneo from October 2010 to April 2011. Oral and written questionnaires, participant observation, review of grey and peer-reviewed literature, and key informant interviews were conducted. Eleven oral questionnaires were administered as a pilot study of indigenous village representatives in English (translated to Malay) at a Partners of Community Organizations (PACOS) Trust Workshop, and 37 written questionnaires (in Malay) were distributed to village representatives at the next quarterly meeting.

Results Cases of customary conservation were observed resilient to religious conversion, shifting land tenure, and "outsider" interests. On the island of Mantanani, Muslim villagers surreptitiously leave offerings for the (animist) sea spirit by their most biodiverse reef in times of sickness. Furthermore, conservation organizations in Sabah recognize their conservation value; a proposed ecological corridor linking Kinabalu Park and Crocker Range Park considers community conserved forests as "stepping stones". The Sabah Department of Fisheries promoted *tagal*, a customary system of fishing restrictions, to 40 villages, some of which had not traditionally practiced it.

Conclusion In the face of rapid land use conversion in the matrix beyond protected areas in Sabah, resilient cases of customary conservation can contribute to the formal conservation network and benefit from recognition and support.

S38.OC.01

Functional connectivity quantified by demographic and genetic data explains species diversity in fragmented landscapes

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Patterns of movement are considered fundamental to determine functional connectivity and species persistence in heterogeneous landscapes. However, movement of individuals does not necessarily translate into benefits at the population level, such as higher immigration rates and population sizes, which are related to lower chances of extinction and higher species diversity. Thus, functional connectivity should ideally be quantified at the population rather than the individual level. Here, we use community, population, and genetic data on small mammals from three fragmented landscapes with different proportions of remaining Atlantic forest (10, 30 and 50%) to: (1) describe patterns of species diversity, (2) propose a conceptual model of how a threshold in landscape connectivity causes an abrupt loss in species diversity, and (3) use both demographic and genetic data on a small marsupial to quantify immigration rates and test the proposed model. Richness and abundance of forest specialist species decreased drastically in the 10% forest cover landscape and were positively related to patch size only in the 30% forest cover landscape. Our model proposes that: (1) functional connectivity is determined by landscape-wide forest cover and is drastically reduced below 10-20% remaining forest given the exponential increase in inter-patch distance at this threshold; (2) at intermediate levels of deforestation, connectivity is sufficient only to maintain stable populations in large but not in small patches, generating species-patch area effects. Demographic and genetic data supported the model with immigration rates being lower in fragments in the 30% than in the 50% forest cover landscape. Moreover, population density, genetic diversity, and genetic differentiation were associated with patch size only in the 30% forest cover landscape. Our results highlight the importance of combining ecological and genetic investigations at different spatial scales (patch and landscape) to advance our understanding of the effects of habitat loss on biodiversity.

S38.OC.02

The role of sex, corridors and experience with fragmented landscapes on inter-patch dispersal movements

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The ability of individuals to disperse between habitat patches is an important factor affecting population dynamics and allowing metapopulation persistence in fragmented landscapes. Any movement of an individual has a strong behavioral component and is also affected by the environment where the animal moves. Dispersal is a process occurring in three stages: emigration, transfer and immigration. However, detailed empirical information about dispersal for most animal species is lacking. Here, we present and discuss the results of translocation and radiotracking experiments with a tropical forest bird (*Pyriglena leucoptera*) aimed at demonstrating the importance of considering the three abovementioned stages when studying animal dispersal. Our experiments were designed to assess how sex or previous experience with fragmented landscapes affects each stage of inter-patch dispersal movements of individuals. Additionally, we evaluated the effects of the bird's navigation capacity and of the landscape configuration (*i.e.* presence-absence of forest corridors) on these movements. Overall, our results showed that: 1) females are better dispersers than males and dispersal success was higher for males with previous experience in fragmented landscapes. Females or experienced males not only emigrated more but were also less predated in the matrix; 2) birds navigation capacity did not vary with sex and 3) forest corridors greatly increased inexperienced males dispersal success. It's worth emphasizing that dispersal is an individual decision-making process, which can be highly variable in heterogeneous landscapes. Thus, considering all dispersal stages is essential, transfer in particular. Moreover, we expect that colonization rates of empty patches may decrease in recently fragmented landscapes because of low patch accessibility to males and due to experienced birds rareness. This effect may be attenuated as some individuals become more experienced with the new landscape configuration. Finally, maintaining forest corridors linking patches is strongly recommended when anthropogenic habitat destruction is unavoidable.

S38.OC.03

What does 'being there' mean? Using individual-bird movements to help interpret site-occupancy results.

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Recent years have seen increasing popularity of site-occupancy approaches to the study of wild populations. When faced with questions about sets of sites, we increasingly ask what is the probability of a species 'being there' rather than 'how many individuals are there' at a site. Focusing on the state of sites, rather than the number or demography of individuals, enables practitioners to study the extensive areas that are relevant for management, while avoiding costly fieldwork required for the estimation of individual-based parameters. Occupancy approaches are thus particularly useful in tropical ecosystems where large areas sustain high numbers of species, each with few individuals per unit area. This useful novelty, however, comes at a potential cost of interpretation, because high occupancy may have at least two different demographic meanings: species may occupy many sites with many individuals that are highly faithful to many sites or, alternatively, they may occupy many sites with a few individuals that move extensively through the available area. These two scenarios have profoundly different implications for conservation. We present an individual-based assessment of site-fidelity for six species of central-Amazon forest-understory birds based on mist-netting data for five antbird species (*Thamnophilidae*) and on color band re-sighting data for one species of ground antbird (*Formicariidae*). Using multi-state mark-recapture models and a spatial model of movement we test predictions about which species are more site-faithful than others and compare site-fidelity results with occupancy estimates from a previous study of the same area. Our data reveal that species with low site fidelity tend to have high occupancy; however, some species with high site-fidelity have relatively high occupancy too. We suggest that highly mobile species which occupy many sites should be the focus of priority conservation concern as they may be particularly vulnerable to landscape change.

S38.OC.04

A population-level approach to dynamic modeling of movement between habitats

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Animal populations often cope with temporal changes in habitat suitability by migrating between habitats. Studies of migratory movements usually rely on tracking tagged individuals but practical limitations (e.g., cost, labor requirements, low recapture rate) sometimes make this approach unfeasible. In such cases, a mass-balance, population-level approach may provide an alternative for studying migration. We present here an approach that uses multivariate dynamic models to quantify rates of exchange between habitats, as well as the influence of environmental drivers on such exchanges. We apply this approach to analyze seasonal movements of fish populations between lateral pools and the main stream channel in an Amazonian floodplain system. Time series of counts for 11 species collected in stream and pool habitats were modeled by means of a coupled system of difference equations. Rates of movement between habitats were represented as a function of time-varying environmental covariates. Model parameters were estimated by MCMC in a Bayesian framework. The multivariate dynamic model was a useful tool for extracting pattern from noisy ecological data. The model quantified species-specific effects of hydrology on movement between habitats, provided measures of the uncertainty associated with the estimates, and allowed for classification of species on the basis of their habitat preferences and seasonal responses to hydrological variation. The model also yielded predictions of population growth and seasonal movement patterns that can be tested directly in field studies of marked individuals. Movement behavior inferred from the model was related to life-history traits, a result that provides insight into adaptive responses to environmental seasonality and allows for identification of species potentially vulnerable to expected changes in hydrological regime.

S38.OC.05

HOW DO CENTRAL AMAZONIAN UNDERSTORY BIRDS USE A HETEROGENEOUS LANDSCAPE? ONE PICTURE FROM DIFFERENT ANGLES

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Monitoring understory bird communities has been a long-term objective of the Biological Dynamics of Forest Fragments Project in the Brazilian Amazon since 1979. The project originally intended to assess biota in forest fragments isolated by an open pasture matrix; however, following abandonment of most cattle farming by the 1990s, the area became a mosaic of primary forest and second-growth. Today, the landscape offers a unique opportunity to examine the impositions of altered habitat structure on vagile species. We examined the effects of second-growth vegetation on the understory bird community using three complementary approaches. Through a long-term capture dataset from 1979 to 2010 we assessed (1) survival/transience estimates in forest fragments and (2) movement across fragment borders; and (3) through direct observation from 2009 to 2011 we mapped fine-scale movement of understory mixed-species flocks. The dataset indicated that survival and transience of forest-dependent insectivores in fragments was positively correlated with age of adjacent secondary forest. It also showed increasing movement between fragments and second-growth during regeneration of the matrix, with 9 of 10 foraging guilds having acquired pre-isolation capture rates after 34 years. Despite that, mixed-species flocks, one of the guilds to have recovered pre-isolation values, still show edge effects in fine-scale movements: all of the 15 observed flocks showed reluctance to cross into second growth and altered movement patterns when they entered second growth. After three decades, we have evidence that second-growth in the study area is becoming more favorable habitat for forest-dependent species; however, it still might not be equivalent to primary forest. With the increasing debate over value of secondary forests to maintaining biodiversity, we advocate multi-faceted approaches to examine this complex ecological issue in order to make sensible decisions for conservation efforts and management policies.

S38.OC.06

Population connectivity in a naturally fragmented landscape: genetic structure and diversity in a white-sand vegetation specialist bird species of the Amazon region

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Understanding patterns of genetic structure and genetic diversity across space is especially relevant in landscapes with discontinuous habitats where dispersal can be reduced. In the Amazon, white-sand scrublands or *campinas*, are currently patchily distributed across the landscape and are surrounded by tall-lowland humid forests. Campinas are habitat for a distinctive bird assemblage that is specialist to this open vegetation. Here we used *Xenopipo atronitens* (Pipridae) as a model species and *mt*DNA sequences to (1) understand population connectivity patterns in a naturally patchy habitat and to (2) determine if current landscape structure explains patterns of genetic structure and genetic diversity of populations. We sampled three locations (hereafter landscapes) along the Rio Negro and Rio Amazonas basins. These landscapes had similar vegetation-cover composition but differed in the amount and configuration of campina habitat (Aracá = 50%, Uatumã = 12%, and Jaú = 2% campina cover). In each landscape we sampled 4-6 sites with similar pair-wise distances (range: 5-43 km), and sequenced the ND2 gene of 10-12 individuals per site (n = 162 sequences, 905 base-pairs). Our results showed: 1) most of the genetic structure was explained by differences among landscapes, with no structure among sites within landscapes; 2) within landscapes, pair-wise genetic distances (*p*-distance) were significantly higher in Jaú than in the other landscapes; 3) no relationship was found between genetic distance and geographic distance within landscapes; 4) Aracá had the highest haplotype diversity and Jaú had the highest nucleotide diversity, and 5) haplotype diversity and nucleotide diversity were positively correlated with the amount of campina-cover within a 5-km radius around each site, but characteristics of this relationship differed among landscapes. We conclude that local landscape structure influenced patterns of genetic diversity, although differences among landscapes need to be understood in terms of both current landscape structure and regional historical patterns.

S39.OC.01

Chronic underestimation of vertebrate abundances in Amazonian ecosystems limits ecological understanding and innovation in conservation

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The relative abundance and spatial distribution of medium and large sized vertebrates in Neotropical forests are customarily assessed through visual encounter data collected along line transects. In partnership with indigenous hunters trained in distance sampling methodologies, over a three year period we simultaneously collected direct, visual records and indirect, sign-based (tracks and other) records of vertebrate occurrence along 216, 4-km long transects deployed in a stratified random fashion over a 48,000 km2 indigenous landscape in the Guyanese Amazon. Accumulation curves, occupancy analyses and distribution maps demonstrate that sign data outperform visual observation data for distribution, occupancy and abundance estimates, and accurately detect the local impacts of hunting. We conclude that visual observation data provide incorrect information on the occurrence and distribution of key terrestrial game species, may be inadequate for assessing population dynamics and community structure of Neotropical game animals and the role of anthropogenic impacts and habitat variation on vertebrate abundances, and may result in faulty management recommendations for indigenous lands and multiple use protected areas. We welcome recent trends towards the use of track based census, and urge that intensive efforts be focused on the calibration of visual record data against track, camera-trap and census data in order to extract more than occupancy conclusions from the data and improve the quality and relevance of management plans and conservation decisions.

S39.OC.02

Occupancy and detection of medium and large vertebrates in a Neotropical landscape

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Understanding the natural and anthropogenic impacts on tropical wildlife populations is critical for their conservation and management. We conducted monthly surveys of animal sign and sightings over 3 years around 23 villages and 4 control sites (8 line transects per site) in the Rupununi region of southwestern Guyana. Multi-season occupancy models were fit for eleven species (*Tapirus terrestris, Tayassu pecari, Pecari tajacu, Mazama amerciana, M. gouzoubira, Odocoileus virginianus, Myoprocta acouchy, Dasyprocta leporina, Crax alector, Penelope argyrotis,* and *Psophia crepitans*). Probability of occupancy and probability of detection were allowed to vary with forest cover, elevation, presence of a village, and/or distance from the transect to site center. Models with all possible combinations of covariates were fit, and a final model comprised of model-averaged parameters was produced for each species. For most species, probabilities of occupancy were higher for sign data than sighting data, and the two data types offered complementary information. In general, forest cover was an important determinant of occupancy. For some species, distance from the transect to a village was negatively related to probability of occupancy and/or detection, while for other species, the presence of a village (in contrast to an unpopulated, unhunted control site) was as or more important than the distance to a village as a determinant of occupancy and detection. Our results suggest that most of these species are persisting throughout the region, even in areas where human hunting occurs.

S39.OC.03

Competition and facilitation in the formation of interspecific primate groups

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The role of interspecific competition in structuring ecological communities is well established, but growing evidence suggests a large additional role for facilitation. In one potential example of facilitation, squirrel monkeys, *Saimiri sciureus*, and brown capuchins, *Cebus apella*, move and forage together in ubiquitous interspecific groups, but the causes and consequences of this relationship are unclear. We used large-scale monitoring by indigenous people to test for facilitation between *C. apella* and *S. sciureus* where the range of *C. apella*, meets the range of its congener, the wedge-capped capuchin, *C. olivaceus*. Using the competitive exclusion between the two capuchins as a natural experiment, we quantified how much the distribution and abundance of *Cebus* and *Saimiri* depends on determinants of the fundamental niche relative to interspecific interactions (the realized niche). Facilitation by *C. apella* increased the fitness of *S. sciureus*, but the fundamental and realized niches equally explained the distribution and abundance of Cebus.

S39.OC.04

Monitoring mammals – a team effort.

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Line transect surveys are commonly used in programs for surveying and monitoring medium and large mammals, usually for analysis in the program DISTANCE. However, results from single transects rarely have sufficient precision to estimate densities, and most researchers ignore the requirement for independent transects to estimate variance in densities. These problems are compounded by the fact that DISTANCE cannot estimate numbers of animals that have essentially zero probability of detection. The most interesting uses of surveys involve the combination of data from many locations and researchers. This means that data will be much more valuable in the long run if made available in public data bases. However, most data are not made available and are lost in the drawers of individual researchers. I describe data collected and made available through the Brazilian Program for Biodiversity Research (PPBio).

S39.OC.05

Complex Interactions Between Biodiversity and Indigenous Amazonian Cultures

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The 300 to 500 million indigenous peoples of the world represent 5000 distinct ethnic groups and occupy 20% of the world's land surface. Indigenous peoples occupy or hold title to 26% of the Amazon Basin, broadly defined to include the Orinoco watershed. This is equivalent to the land extension currently designated as category I-IV protected areas, and proposed biodiversity conservation corridors include extensive areas of indigenous land. Although there is evidence that in the Amazon officially titled indigenous territories are more effective that protected areas at preventing forest clearing, there is also evidence that as indigenous peoples become sedentary and integrate with national socio-economic systems, they exert unsustainable pressure on vertebrate game animals. Such overexploitation appears to be a consequence of complex interactions between indigenous resource-use practices, a growing population, adoption of new technologies, and direct and indirect influences from the surrounding non-indigenous landscape. Traditionally, the discussion of the role of indigenous lands in conservation has been a balance between human rights and biodiversity conservation. Taking a coupled natural-human system approach to these lands offers a different perspective and possibly different management solutions. Vertebrate game animals have been persistently hunted in these regions for millennia, and continue providing an irreplaceable source of protein for indigenous populations. These animals form part of complex spiritual systems that govern human interactions with other different elements of the natural environment. In a linked system, non-human vertebrate abundance and diversity patterns may reflect long-term human use patterns and spiritual belief systems. Changes in one component of this system should lead to a response by the other. We describe spatial patterns of vertebrate biodiversity and abundance for a region of Amazonia, and relate them to cultural practices of indigenous peoples over an approximately 48,000 km sq. area.

S39.OC.06

Empowering local people through community-based resource monitoring: Applications of the comparison between Amazonia and Namibia in a national Brazilian biodiversity monitoring program in protected areas

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Biological resource monitoring systems are implemented in many countries and often depend on the participation of local people. It has been suggested that these systems empower local participants while promoting conservation. We reviewed three wildlife monitoring systems in indigenous lands and sustainable development reserves in Brazilian Amazonia and one in Namibian Caprivi Conservancies analyzing the strategies adopted and conditions that facilitated local empowerment, as well as potential impacts on conservation. This provided insights into potential avenues to strengthen empowerment outcomes of monitoring systems in Latin America and Africa. We assessed four dimensions of empowerment at individual and community scales: psychological, social, economic, and political. The conditions that facilitated local empowerment included the value of natural resources, rights to trade and manage resources, political organization of communities, and collaboration between stakeholders. The wide range of strategies to empower local people included intensifying local participation, linking them to local education, feeding information back to communities, purposefully selecting participants, paying for monitoring services, marketing monitored resources, and inserting local people into broader politics. Although communities were socially and politically empowered, the monitoring systems promoted individual empowerment more often. Marketing of natural resources promoted higher economic empowerment in Conservancies in Namibia, while information dissemination was better in Brazil with integrated education programs. The Brazilian government recently launched a national scale biodiversity monitoring program in protected areas that considers taking advantage of local facilitating conditions to enhance the empowerment of communities while provide information for local management decisions and national conservation goals.

S40.OC.01

Conservation of tapirs at the EDGE: an insight into our knowledge of this unique species

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Evolutionarily Distinct and Globally Endangered (EDGE) species are unique given their evolutionary history and endangered status. Given their characteristics, tapirs are considered EDGE species and are therefore of special conservation concern. The increased interest in these species requires an up-to-date review of the status of their research. We evaluated the status of tapir research that supports their categorization as EDGE species to propose potential lines of research that are required to promote their conservation. For this objective, we reviewed the abstracts of papers that resulted from a web search with “tapir” as keyword in the Web of Knowledge database. Abstracts were categorized by year of publication, discipline of study, tapir species studied and Journal of publication. Based on these abstracts, we identified gaps in the current knowledge on these species. We analyzed a total of 294 abstracts. Our preliminary results show that 52% of the studies were published after 1990. The main areas of study were ecology (33% of the abstracts) and palaeontology (22%), which suggests that their categorization as EDGE species has been supported by recent research on the evolution and ecology of the species. However, we observed that some sub disciplines were overrepresented; for example, 34% of the ecological studies focused only on seed dispersal and frugivory. Based on our review we identified that few studies focus on the field study techniques, population status, interactions with other species and movements, undermining conservation efforts. Tapirs are important given their unique evolution and the threatened status of their populations. However, their importance also relies on the interactions with other species and the potential effects of their extinction on their habitat. Future studies on the ecological cascade effects on tapir defaunated sites and the disruption of their movement patterns should be evaluated to emphasize the uniqueness of this species.

S40.OC.02

The IUCN/SSC Tapir Specialist Group (TSG) and Tapir Conservation Worldwide

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The IUCN/SSC Tapir Specialist Group is a global network of in-situ and ex-situ conservationists and advocates dedicated to conserving the four tapir species and their remaining habitat through information sharing, strategic action-planning in countries where tapirs live in Central and South America and Southeast Asia, and educational outreach and awareness campaigns showing the importance of tapirs to local ecosystems and to the world at large. Currently, the TSG has 120 members from 27 countries worldwide. This presentation will provide a brief overview of the work of the TSG. The first part of the presentation will focus on describing how different threats and land use changes impact tapir populations throughout their distribution ranges and, most importantly, how the TSG and other important stakeholders have been addressing these issues through action planning initiatives both at the species distribution level as well at the national level. Currently, the TSG has been putting a lot of effort into establishing regional tapir conservation committees and developing National Tapir Action Plans for each tapir range country in South and Central America and Southeast Asia. The priority for the coming years will be the effective implementation of such plans. The second part of the presentation will focus on the main results from the Sixth International Tapir Symposium held in Malaysia in October 2011. This conference is the main event of the TSG, providing a critical opportunity for the discussion of tapir conservation issues through a combination of presentations, posters, thematic round-tables and planning and priority setting workshops. The Tapir Symposium is held every three years and has proven to have a considerable impact on the design and implementation of long-term conservation strategies for tapirs, both in-situ as well as ex-situ.

S40.OC.03

Botany, Genetics and Ethnobotany: a Crossed Investigation on the Elusive Tapir's Diet in French Guiana

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The lack of qualitative and quantitative information on the trophic relationships of the large herbivores with the outstandingly numerous plants of the rainforest remains a major challenge in fully understanding their role in the functioning and diversification of the rainforest ecosystems. Indeed, since the rainforest large herbivores are elusive animals, the study of their foraging strategies must rely on invasive analyses or other tedious indirect methods. Consequently, very little is known about the range of plants impacted by the large rainforest herbivore community, but also about the food selectivity of herbivores and how it affects their spatial behaviour and resource partitioning.

In this study, we illustrate that the original coupling of classic methods with genetic and ethnobotanical approaches yields information both about the diet diversity, the foraging modalities and the potential impact on vegetation of the largest terrestrial mammal of Amazonia, the lowland tapir. The study was conducted in the Guianan shield, where the ecology of tapirs has been less investigated.

We discuss the relative contribution of our different approaches, notably the contribution of next generation sequencing and genetic barcoding, used for the first time to investigate the diet of a large tropical mammal, and how local traditional ecological knowledge is accredited and valuable for research on the ecology of elusive animals.

S40.OC.04

Effectiveness of the largest Atlantic forest corridor in promoting gene flow of lowland tapir

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Processes and patterns of gene flow are related to biological and behavioral aspects inherent to the species and to how landscape characteristics structure their populations influencing their dispersion ability. The overgrowth of human populations and the consequent expansion of its activities have resulted in the fragmentation and habitat loss. Medium and large sized mammals are the most vulnerable species to forest fragmentation. However few studies aim to examine the gene flow of these mammals within large continuous areas. We used a population of lowland tapir (*Tapirus terrestris*) habiting the largest corridor of the Brazilian Atlantic Rainforest, the Serra do Mar continuum (SM) as a model. We hypothesized that this corridor promotes effective gene flow between populations of tapirs. Tapir faeces were collected as DNA source in two sites within SM: Serra do Mar State Park/Santa Virgínia (hereafter SV) and Carlos Botelho State Park (hereafter CB). Individual identifications were performed using microsatellite markers. DNA extraction success was high (68%) and genotyping success ranged from 54%-77%. A total of 23 individuals and nine recaptures (three animals) were identified within 3000 ha in SV, and 24 individuals and 19 recaptures (five animals) within 4400 ha in CB. Bayesian and F_{ST} analysis indicated a significant genetic differentiation between the two populations. Contrary to expected, populations of this mega-mammal, supposedly capable of traveling long distances, are structured within this large corridor of pristine forest, indicating restricted gene flow. Genetic structuring can be naturally found in species. However, roads, human presence and hunting within SM could be barriers or filters, reducing the gene flow between areas. Such results added to a landscape survey, including hunting pressure and human presence, can be valuable for the better understanding of the vulnerability of tapir populations in this corridor, providing important information for the species conservation.

S40.OC.05

A novel approach to monitor tapir populations: A study case from El Triunfo Biosphere Reserve

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Baird´s tapir (*Tapirus bairdii*) is a very distinctive element of the mammalian fauna from the Neotropics due to their evolutionary and ecological characteristics. This species is the only native representative of the Perissodactyla in the region and the largest terrestrial vertebrate. As a result of the combination of habitat loss, hunting, disease and incidental killings tapir populations have gone extinct or are seriously diminished all over the species' distribution range formerly extending from northern Ecuador-Colombia to southern Mexico. Critical for the assessment of tapir's response to anthropogenic perturbation and the designing of conservation and management strategies is the ability to monitor its populations in a precise and cost effective way. However, tapir's secretive habits and occurrence in dense forests greatly limit the effectiveness of standard surveying techniques. Here we apply a novel approach based on the combination of camera-trapping, the random encounter method and occupancy models to calculate tapir density and describe habitat use in one of the species' most important strongholds in southern Mexico: El Triunfo Biosphere Reserve. After 8 months of continuous camera-trapping we found that tapir density in one of the reserve's core zones was 0.02-0.18 ind./km^2 (95% confidence intervals). Moreover, we found significant temporal variation in occupancy ranging from 13% to 31% of the surveyed area. An important finding was that tapir activity concentrated in a small portion of the core zone close to one of the reserve's borders. Our approach probed to be effective to estimate important parameters key to assess tapir population status and to design management actions. Increased use of approaches such as the one applied here, over the entire Baird's tapir distribution range, would help to get a more comprehensive assessment of the global conservation status of this very important species.

S40.OC.06

Jaguar population viability: from a landscape perspective to a continental scale approach

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Extinction risk measures are essential parameters to plan species conservation in a world where degradation rates are soaring. We investigate the influence of landscape configuration in the extinction risk of jaguar (*Panthera onca*) populations, identifying important landscape attributes in survival probability and relating with jaguar conservation initiatives. We selected 25 sites with jaguar population studies and simulated population viability using the software VORTEX. Population viability was related with scores of a component principal analysis, which condensed information about landscape configuration without the redundancy of landscape metrics. We observed that the 16 jaguar populations are unviable and all viable populations are composed by a single, non-subdivided population. The unviability of metapopulations could be due to: (1) lower habitat availability; (2) lower jaguar densities; or (3) smaller populations behaving as sinks. Evaluating habitat availability and jaguar densities in landscapes, we rejected the first and the second hypotheses. We noted a considerable influence of landscape configuration on population viability (R^2=0.41; $p<0.01$), but we observed that the most important metric to jaguar viability was the total habitat available, since this metric influenced all others due to the high average of habitat area in the landscape (77.7%). To associate jaguar conservation needs with current jaguar conservation initiatives, we investigated if jaguar viable populations are located within Jaguar Conservation Units (JCU). We did not observe a relation between JCUs and viable or non-viable populations (Exact Fisher Test; p=0.61), suggesting that JCUs were not selected taking into account proactive or reactive conservation strategies for jaguars. Therefore, we suggest the use of a landscape approach and population viability analysis to design jaguar conservation strategies in continental and landscape scale.

S40.P.01

Reestablishing ecological processes in tropical forests: reintroduction of an important seed disperser in the Brazilian Atlantic Forest

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Species reintroduction has become a useful conservation tool. The red-humped agouti (*Dasyprocta leporina*) was locally extinct in the Tijuca National Park (Rio de Janeiro, Brazil) decades ago. A reintroduction project has been carried out since 2009, in order to reestablish a viable population, aiming to improve the recruitment of large-seeded trees which depend on agoutis for seed dispersal. This study had the following goals: (1) to evaluate the short-term success of the reintroduction, (2) to describe agoutis' spatial patterns and (3) to evaluate the restoration of ecological interactions. Reintroduction followed a soft-release protocol. Eleven reintroduced individuals were radiotracked in different periods from September 2009 to March 2012. Trapping sessions were carried out in January-February 2012 in order to fit radiocollars to young individuals and to replace exhausted batteries. Only two released animals were found dead; the fate of two others is unknown. At least seven agoutis were alive in March 2012, with an estimated annual survival rate of 0.83. Over ten newborn individuals were observed during the study, although they could not be trapped and radiocollared and thus their survival is unknown. Reintroduced agoutis established home ranges of similar size of those known for the species, without differences between sexes and with a dynamic territorial behavior, with males defending temporary resource patches. Agoutis consumed at least 37 species of fruits and seeds; three of them were dispersed and buried. An experiment using tagged seeds of the palm *Astrocaryum aculeatissimum* showed that 20% of them were scatter-hoarded in agouti areas, while none was buried in areas without agoutis. The establishment of home-ranges, independence of food supplementation, high survival and successful reproduction are evidence of short-term reintroduction success. Besides, seed dispersal indicates that at least some of the ecological interactions involving agoutis have been recovered in this forest.

S40.P.02

Camera trapping of jaguars (*Panthera onca*). Density estimate in the "Várzeas do Rio Ivinhema" State Park, Mato Grosso do Sul, Brazil.

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The "Várzeas do Rio Ivinhema" State Park (73,300 ha) is located in the last area not affected by dams in the Paraná River floodplain. This marshland protected area is essential for jaguar conservation in the "Upper Paraná River" region, in the western border of the Atlantic Forest biome. To jaguar density estimate in the Ivinhema State Park we used camera trapping during 100 days (2008/2009) (*n*=1500 trap-nights). The Park area was divided into five quadrants with sizes based on the home range of jaguars, obtained with telemetry in the study area. In each quadrant were set three stations with two camera traps each. The analyzes were performed using the Capture ® software with the premise that is a closed population, following the capture-recapture methods. There were 69 records of jaguars and the estimated population in the area was 14 (SE = 2.77) animals (adults and sub-adults) resulting in a density of 0.96 individuals / 100km2. Compared to other areas this density is low. Therefore the work for jaguar conservation and management plans in the Upper Paraná River should cover the entire region including other protected areas.

S40.P.03

The jaguar's patches: how many habitat remnants are needed to keep jaguars in a fragmented landscape?

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Habitat loss and fragmentation (HLF) are the main threat to biodiversity, acting synergistically in the environment. However, to discriminate the effects of habitat loss from fragmentation on species is important due to the influence on population dynamics. Thus, we isolated the effects of these processes on jaguar (*Panthera onca*) population viability, finding critical thresholds for habitat loss and for habitat fragmentation (HCT and FCT). The population viability was analyzed by using the VORTEX software. To estimate HCT, we modeled population dynamics in a landscape of 10,000km^2 and reduced the total area gradually. To calculate FCT we maintained total area of suitable habitat constant throughout scenarios, which were subdivided progressively. HCT and FCT were calculated by piecewise linear regression. The sensitivity analysis was done by a regression tree through 200 hypothetical populations with random values of mortality and proportion of male breeders, because these were life history characteristics poorly estimated in the published literature. Jaguar HCT varies largely (1,933 to 7,535 km^2), but it may be used as an indicator of protected areas size. We observed jaguar metapopulation viability on restricted environmental conditions, with large areas and high densities. In fragmented landscapes, the total area needed to maintain a viable metapopulation increase compared with in areas of a single patch. However, a large part of the current jaguar distribution is composed by highly fragmented landscapes, making viable the strategy of landscape with patches distributed in order to maintain a viable metapopulation. These results are generalization that may be better estimated through higher accurate values of adult female mortality, since the high sensitivity of this parameter on the viability calculated.

S41.OC.01

Why do we need more emphasis on capacity building for effective biodiversity conservation? A call to action.

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Funds and experts have funneled into tropical regions for years for biodiversity conservation. Despite this long term commitment in time and money, recent reviews show continued loss of tropical forest, species remain threatened, and wildlife-human conflict persists. While various agendas have been proposed to improve conservation effectiveness, I posit that capacity building must be in the mix. Research has shown that complex environmental problems -what we face in the tropics- are best solved by cross-disciplinary collaboration among scientists. This must extend to cross-cultural collaboration among individuals involved in tropical conservation, with attention paid to building knowledge bases for effective research and conservation. We must take a 'funds of knowledge' perspective rather than a 'deficit perspective' – while there may be a perception that capacity is lacking in a country slated for a conservation initiative, inherent strengths, existing capacities and knowledge are present and integral to success. A commitment to capacity building means additional time and money, and often not doing things exactly as you want to do them, but outcomes will get us closer to conservation goals. Many conservation organizations have capacity and education in their mission statements. Yet most tropical countries still lack trained people and resources to sustain conservation initiatives after projects end, and most projects are initiated externally. This may in part explain why our conservation dollars and efforts have not been more effective. Devoting time and money to capacity building can build sustainability and resilience. The call to action: Research is needed to explore whether and how capacity building and collaboration leads to more effective conservation. Where you see a conservation action, ask: where are the professors or students from the local university? Where is the local expert? Through shared learning, decision-making and experience, conservation efforts will become more effective and sustainable.

S41.OC.02

Strengthening Training for Biodiversity Conservation through Partnerships of Educators and Practitioners

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Tropical biodiversity faces real threats and conservation challenges. Despite a plethora of conservation efforts, biodiversity loss is still occurring at alarming rates due to local, regional, and global pressures. A persistent limitation for effective conservation has been the shortage of qualified local conservation professionals and training opportunities and resources, to train students, trainers and decision-makers. The Network of Conservation Educators and Practitioners (NCEP) has led a collaborative effort to increase the capacity of higher education institutions in Bolivia (since 2003) and Peru (since 2006) to train a new generation of conservation researchers and practitioners. To achieve this goal, we have: 1) supported the development and integration of teaching and learning materials in biodiversity conservation (*modules*) in academic and professional training programs, and 2) promoted collaboration among conservation educators and practitioners on the development and implementation of field courses. Over the course of the last nine years and through our activities under different projects, we have trained over 900 faculty and developed 24 training modules in Spanish, which are being used in a diversity of contexts. We estimate that these materials have reached at least 6,200 students in the last two years alone. Professors have also collaborated with practitioners to organize field courses that provided training for almost 200 protected area staff, local community members and university students. Additional results include the establishment of collaborations among different academic institutions, both public and private, and regionally, as well as with non-governmental institutions. Our results show that continued engagement provides positive results on

capacity development through the establishment of stable partnerships and sustained capacity. Conservation educators and practitioners are strategic allies to work on capacity building and the train-the-trainer model is highly successful. We encourage other initiatives to follow this model for other regions.

S41.OC.03

Fostering Human Wellbeing to Effectively Conserve Biodiversity

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Capacity building is increasingly cited as an essential component of programs that aim to both conserve biodiversity and foster the wellbeing of humans involved in that conservation. This paper contributes to the current debate about the topic by presenting an analysis of the conservation literature on capacity building at the institutional, community, and individual level. Through this analysis, I argue for a deeper investigation of the definition and development of individual capacity in this context. I propose theoretical insight from the field of psychology to help supplement our current understanding of individual capacity for biodiversity conservation. Based on this investigation, opportunities for further research and implications for the design of capacity building projects in biodiversity conservation are discussed. For example, there is an opportunity to examine the role of psychological concepts such as personal control, self-efficacy, and meaningful action in the development and maintenance of individual capacity for biodiversity conservation. Together, this paper offers a novel approach to sustaining conservation action by suggesting the requisite cultivation of human wellbeing from an individual perspective.

S41.OC.04

Building capacity from the ground up: A place-based collaborative conservation case study from Indonesia

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In the past, conservation efforts in many tropical developing countries have not, as a general rule, utilized capacity building to maximize project effectiveness at achieving conservation goals. Capacity building, however, is an integral component of place-based conservation projects. It contributes to maintaining linkages between social and ecological systems, and integrating local communities and conservation at the most fundamental level to give local people physical and mental ownership of resources. Capacity building also helps to redefine the relationship between human communities and the land by fostering the development of a different land ethic based on stewardship rather than management. Using a case study from Kalimantan, Indonesia, I will show why capacity building must be incorporated into the foundation of the conservation project so that its development is inherent in the process, rather than an afterthought. I will demonstrate how stakeholder and social network analyses directly contribute to an understanding of the current social capacity for change. This insight into the social capacity in local communities highlights the barriers that prevent future progress towards achieving conservation goals. The role of capacity building is to address and remove these barriers so that true collaborative conservation can occur in which local communities and conservationists collaborate to develop the framework for proactive problem solving. Capacity building, therefore, is a critical part of the process to maximize the full potential of conservation projects to make a lasting difference in ecosystems and in human communities.

S41.OC.05

The Tropical Conservation & Development Program: An innovative training platform to address multi-scalar and multi-disciplinary challenges of conservation and development in the Tropics.

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The Tropical Conservation and Development (TCD) Program at the University of Florida was established more than two decades ago in recognition that socio-ecological systems are inherently complex and inter-connected. Consequently, solutions to conserving biological diversity and improving human well-being require integrative and novel approaches that transcend traditional academic disciplinary boundaries. Further, it requires individuals with practical skills who embrace working in teams with diverse stakeholders to define, tackle, and solve complex problems. At the heart of TCD is an innovative learning and action platform, where students, faculty, alumni and collaborators interact to address multi-scalar and multi-disciplinary challenges. TCD's approach builds on traditional disciplinary foundations, integrates past and present student experiences, and embraces collaborative learning and action with partners involved in the day-to-day realities of conservation and development in the tropics. TCD encourages research and training activities developed in close collaboration with host-country partners. Housed within the UF Center for Latin American Studies, TCD draws on the participation of core faculty and approximately 100 faculty affiliates from over 20 academic units across campus. TCD is not a degree-granting program, but offers an interdisciplinary certificate and concentration to students enrolled in Master's or Ph.D. programs. The challenges facing TCD Program are those faced by many inter-disciplinary capacity building programs around the world. These challenges, our efforts and effectiveness to deal with both these and other opportunities are discussed.

S41.OC.06

Documenting 50 Years of Tropical Biology through the Eyes of OTS and ATBC

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The Organization for Tropical Studies (OTS) and the Association for Tropical Biology and Conservation (initially ATB, now ATBC) will both be celebrating their 50th anniversaries in 2013. The two organizations were founded in recognition of the need to foster research and training in tropical biology. While the primary mission of ATB founders was to create an influential professional society and research publication outlet (*Biotropica*), the founders of OTS sought to establish a center in Costa Rica for research and graduate training.

In recognition of the 50th anniversary, OTS and ATBC are embarking on a project to develop an on-line historical archive of the history of both organizations and, more broadly, the history of tropical biology. This archive will have searchable databases that include written materials, photographs, and oral histories.

During this talk, Dr. Losos will provide an overview of the early history both OTS and ATBC, supported by photos, written accounts, and videos already collected for the historical archive. She will also provide instructions for contributing materials to the archive, including the opportunity to be interviewed and videotaped during the Bonito meeting.

S42.OC.01

Ecological science in Brazil – a brief overview and current issues

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Ecological science in Brazil has early roots in the 19th Century, but its effective expansion and institutionalization was fostered by the first graduate programs from the mid-1970s onwards. In this fairly short period, the number of ecologists and institutions with active research groups has grown explosively. Today, ecological research is conducted in over 40 universities with graduate programs, and also by many groups in governmental and NGO-supported institutes. In the last two decades, Brazilian academic productivity in ecology has achieved international recognition. At the same time, environmental issues, with attendant legal, implementation and policy questions are considerable and complex in Brazil. However, ecological scientific knowledge is largely marginalized in legal and policy discussions; ecologists are mostly branded and disqualified as environmental activists, as opposed to "real" scientists. Compounded by a widespread concern in Brazil of foreign cupidity for its natural resources and territory, ecological science is far from realizing its potential contribution to the country's environmental law reforms and long-term socioeconomic design.

S42.OC.02

Ecological science in Chile: current status and interfaces with society.

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The unique geographic setting of Chile, where a remarkable diversity of climates and ecosystems is accompanied by at least two biodiversity hotspots of global importance, has created a biogeographic mosaic that is an important node for ecological research in the southern Hemisphere. Ecological science in Chile is relatively new, research started during the early 60's got established only during the early 70's. Out of just 15 universities certified as national research entities, only seven host certified postgraduate programs in ecological science. These few universities dominate the national research system and are largely responsible of developing basic scientific research. Ecological science got a late start in academy and society, but a steep increase over the past decade, there are currently 25 postgraduate programs taught by eleven universities, most of them certified, plus five centers of excellence in research. The Sociedad de Ecologia de Chile (SOCECOL) has began to bridge the gap with society by filling several major observations to a new law creating a national system of biodiversity and protected areas and providing commentaries for new fisheries laws and marine conservation strategies. SOCECOL is also leading an effort by integrating high executives from government and industry into custom-designed courses in ecology and conservation. Emergent opportunities are coming through a new high school curricula with emphasis on evolution and ecology; a drive in public funding to engage secondary pedagogues in college-level studies; and a growing scientific development in the field of evolutionary biology. We continue working on the base that, as usual, the key to protect nature lies in educating present and future decision makers about the choices, and possibilities, they face to steward our natural heritage.

S42.OC.03

Actions, challenges and perspectives from AsAE (Asociación Argentina de Ecología)

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The Ecological Society of Argentina (AsAE) is 40 years old. The main goals of the society are (i) the development of ecological research, (ii) the improvement of professionals and (iii) to solve environmental problems. In this period, AsAE has organized 25 national or regional congresses every two years; published a regular journal with a high standard review process, including a forum section with contributions by senior ecologists and a section on tools for teaching ecology, in addition to regular papers; has produced a monthly e-bulletin (AMEN) with ecological news (graduate courses, job opportunities, meeting information, etc.) subscribed by over 3,500 Latin-American ecologists; created an environmental committee to develop position papers on different environmental problems of regional impact and social interest . Environmental issues are considerable and complex in Argentina, with an increasing social demand for solutions and policy implementation and control. However, ecological scientific knowledge is largely marginalized in legal and policy discussions. We agree on the potential value of a regional alliance among South American ecological societies to develop common objectives, share experiences, and define new strategic tools to develop better scientific knowledge and to educate ecologists of high professional standard.

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Ecological science in Mexico – a brief overview and current issues

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Ecological science in Mexico ? a brief overview and current issues

Although studies on biotic communities and populations in Mexico have a long tradition, Ecology as a scientific discipline is relatively young, and can be traced back to three researchers who founded research institutions in the 1970´s as a reaction to official programs that promoted the deforestation of great expanses of the country, the fifth most biodiverse of the world. Forty years on, international collaboration, the support through scholarships of CONACyT for students abroad, the development of postgraduate programs in Universities and Public Research Centers, and the stimuli provided by the National System of Researchers has resulted in around 400 ecology-oriented scholars, an increasing production of high quality national and international literature, and the publication of the Natural Capital of Mexico in a multidisciplinary effort coordinated by CONABIO. There is growing influence of scientists in decision making, but there is still much to be done due to the pressure exerted by economic development. In this respect, much international and interdisciplinary collaboration is needed, and its promotion is one of the main goals of the SCME, founded in 2005.

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Ecological science in Costa Rica: a meeting point for the Americas

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Organization for Tropical Studies

For the last half century, Costa Rica has served as a Mecca for tropical biologists: Located along the land bridge connecting North and South America, the country has a rich biogeographical history. In this small country, scientists have relatively easy access to a wide range of ecosystems with contrasting climates, elevations, and soil types. Consequently, Costa Rica early on became a meeting point for scientists across the America to do research and training. Costa Rica has also long attracted foreign scientists to work in research institutions such as the Organization for Tropical Studies, INBio, CATIE, and the Tropical Science Center. Increasingly, Costa Rican public universities also host internationally recognized scientific research programs. Given its biogeographic and anthropogenic position as a hub for tropical research, is not surprising that Costa Rica continues to host many of the longest running ecological studies in the new world tropics.

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Cross-national patterns of productivity and collaboration by Latin American ecologists

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Recent decades have seen important advances in the scientific output of developing countries. Nevertheless, the production of scientific knowledge remains geographically and economically skewed, with far greater productivity by scientists in the United States, Europe, and Japan. This "knowledge divide" is seen as a major impediment not only to the advancement of science in developing countries, but to broader efforts at economic and social development as well. However, comparisons of scientific output between "developed" and "developing" countries often mask important regional disparities in the rates of scientific productivity and national investment in science funding. Failure to account for these disparities can result in, for example, incorrect policy recommendations for advancing national scientific development. We analyzed using all articles published from 2001-2010 in the 50 ecological journals with the highest impact factors (N >12,000 articles), we counted the number of publications produced by authors based in each of 18 countries in Latin America, identified the proportion of articles produced per country in which the primary author is from the home country vs. abroad and, and calculate a suite of metrics describing the structure of the co-authorship network, including the number of nodes (= authors), the number of edges (= coauthors), and the degree of connectance. Our results suggest that in addition to population size (a proxy for the number of scientists in a country) and national investment in science, there is a relationship between productivity and willingness or the ability to collaborate, especially with scientists based abroad.