

MIRMECOBH



XXIV

BELO HORIZONTE.MG

**SIMPÓSIO DE
MIRMECOLOGIA**

An international ant meeting

**Abstract
BOOK**

XXIV SIMPÓSIO DE MIRMECOLOGIA

AN INTERNATIONAL ANT MEETING

ABSTRACT BOOK



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MIRMECOLOGIA**
BELO HORIZONTE, MG | *An international ant meeting*

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UNIVERSIDADE FEDERAL
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1

XXIV SIMPÓSIO DE MIRMECOLOGIA TEAM

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2

SYMPOSIA

2.1 STUDYING TRAIT EVOLUTION IN ANTS USING TREE THINKING

2.1.1 TAXONOMIC, FUNCTIONAL AND PHYLOGENETIC DIVERSITY OF ANT ASSEMBLAGES IN SAVANNA AND FOREST FORMATIONS OF THE BRAZILIAN CERRADO

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Ecological studies are no longer limited to understanding patterns of taxonomic diversity but, increasingly, they also include information on the functional (variation of traits between species) and phylogenetic (genetic relationships between species) structure of biological assemblages. We compared taxonomic, functional and phylogenetic diversity across two contrasting habitats (forest and savannas) in ant communities in Cerrado biome. We investigated the phylogenetic conservatism of morphological/functional characters that are relevant to each ant community, and we tested their correlation with adaptations to the environment they occupy. All analyses utilized phylogenies reconstructed using ultra-conserved elements (UCEs) for 243 Cerrado species. We collected ants at four sites within the Cerrado biome as well as in one disjunct savanna (cerrado) site within the Amazon basin. The analyses considering each distinct community (forest and savanna) showed that the species from these habitats are closed related. Also, our analyses showed that Alter do Chão, the disjunct site, has a subset of species of the other three sites, indicating the community of this site is nested to other sites rich in species. (PPG Ecologia UFU, CAPES, FAPEMIG, CNPq)

2.1.2 TREES AND THE EVOLUTION OF ECO-MORPHOLOGICAL TRAITS: LESSONS FROM THE TURTLE ANTS (*CEPHALOTES*)

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Explaining the evolution of physical castes remains one of the most enduring challenges of social insect research. Broadly, the exaggerated and often extreme traits of a distinct caste are thought to be adaptations to maximize performance in particular ecological tasks that the colony faces. Nevertheless, our understanding of what kinds of ecological pressures select for the evolution of a caste, how particular ecological interactions continue to shape the evolution and diversification of caste phenotype, and how this process unfolds at a macroevolutionary scale remain limited. In this talk, I use the turtle ants (*Cephalotes*), an arboreal lineage with an exceptional caste system, to explore the evolution of caste eco-morphology. These analyses are possible only because of the increasingly detailed knowledge of the ecological function of caste traits in this group, species-level morphological data, and a robust species-level phylogeny. In particular, these analyses focus on testing the longstanding ideas that 1) caste evolution is directional, with “proliferation” of greater caste specialization over time, and that 2) traits are extensively coupled within and among castes, potentially limiting the scope of adaptive caste evolution. The focal eco-morphological traits for these analyses are soldier morphotype and head size. Morphotype determines the size-class of nest entrances and the defensive strategy that species use, while head size quantitatively determines the entrance size that soldiers can defend effectively. The analyses reveal that the soldier evolution in the turtle ants is unexpectedly and extensively reversible and repeatable, involving considerable decoupling of trait evolution within and among castes. In particular, the dynamics of soldier morphotype and head-size evolution both lacked directionality and differed from each other. The evolution of soldier head-size was also largely decoupled from morphotype, such that substantial eco-morphological change has evolved in one trait without change in the other. Finally, the disparity and novelty of soldier head-size relative to the queen was decoupled from absolute queen head-size, establishing that the level of eco-morphological divergence among castes is not necessarily bound to the potential limits set by trait expression in the queen. Broadly, these findings reveal that caste evolution may be far more dynamic than previously expected, with decoupled trait evolution within and among castes especially important in facilitating adaptive diversification in ant lineages. (GWU, NSF)

2.1.3 EXPLORING CONNECTIONS BETWEEN MICROBIAL COMMUNITY AND HOST PHYLOGENETIC HISTORY, A POWERFUL TOOL TO BETTER UNDERSTAND THE EVOLUTIONARY SIGNIFICANCE OF THESE ASSOCIATIONS IN NATURE

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To understand the patterns of biodiversity it is important to consider symbiotic interactions as they can shape animal evolution. In several ant genera symbiotic interactions with microbial communities have been shown to have profound impacts for the host. For example, we know that for Camponotini the gut community can upgrade the host's diet and is shaped by development and colony interactions. However, what is true for one ant group may not be true for another. For the microbial communities that have been examined across ants we see variation in the diversity, host factors that structure these communities, and the function these microbes provide for the host. In the herbivorous turtle ants (*Cephalotes*) their stable symbiotic interactions with gut bacteria have persisted for 45 million years with the gut bacteria synthesizing essential amino acids that are used by the host. Although we know the function for some of these turtle ant-associated bacteria there are still many open questions, including: How are these microbes acquired? Is there horizontal transmission of bacteria across host species? How do host evolutionary and ecological processes shape the diversity of this symbiosis? Using Next Generation Sequencing (NGS) we examined the microbial communities of a diversity of species of turtle ants across different localities and in the context of the host's phylogenetic history. Our results advance our knowledge of the natural variation of microbial symbionts of the ant host, which allows better understanding important aspects of ant biology.

2.1.4 PHYLOGENOMICS AND THE EVOLUTION OF DEFENSIVE TRAITS IN ANTS

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The evolution of defensive traits often has significant consequences for species diversification and morphological divergence, for example by driving escape-and-radiate dynamics. Here, we present evidence for defensive trait-based diversification in ants as well as potential drivers of spine evolution in the charismatic, hyperdiverse spiny ant genus *Polyrhachis*. We also present preliminary results from a phylogenomic study of *Polyrhachis* using ultra-conserved elements (UCEs). Defensive traits exhibit an evolutionary trade-off on a broad scale across all ants, with a sting trading off with spines as well as a few other defensive traits. Furthermore, spines are associated with increased diversification rate. Lab trials with *Polyrhachis* colonies reveal that spines are positively associated with resource foraging and competitive abilities as well as predator-prey survival, further supporting the important role of spines in ant ecology and evolution. A new, expanded *Polyrhachis* phylogeny, in conjunction with morphometric and biogeographic data, will allow for robust testing of the hypotheses supported by this prior work.

2.2 ANTS AND THEIR ECOLOGICAL ROLES IN HUMAN MODIFIED LANDSCAPES THROUGHOUT BRAZILIAN BIOMES

2.2.1 ANTS AND THEIR RESPONSES TO LAND-USE TYPES AT SOUTH BRAZILIAN GRASSLANDS

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South Brazilian grasslands (Campos Sulinos) are natural ecosystems historically linked to livestock grazing and prescribed burnings, that under sustainable management are known to maintain high levels of biodiversity. In the past decades more than half of their natural vegetation cover was lost to other land uses, such as agriculture and tree plantations. Therefore, there is an urgent demand for standardized protocols for suitable management practices, conservation, and restoration of these grassland areas. However, this first requires increased scientific efforts to understand how biological communities and their ecosystem functions respond to different land-use types. Myrmecofauna can be directly and indirectly affected by the variation on resources, microhabitat and environmental conditions driven by varying land-uses. In this talk I will present an overview of published and unpublished studies on the responses of ant community structure and diversity to land-uses types in South Brazilian grasslands. Ant species composition seems to be a very sensitive indicator, clearly varying among grasslands with different (i) historical uses (primary x secondary), (ii) grazing intensities (from lightly to heavily grazed sites), (iii) management combinations (fire, grazing, fire + grazing), and (iv) time-since-fire categories (from few months to more than two years since the last fire). Ant richness decreases (i) with the lost of natural grassland areas in the landscape, (ii) in secondary [previously converted to arable fields and/or pine plantation] in comparison with primary grasslands, and (iii) in grasslands under management reduction or suppression in relation to those traditionally managed. Nurse plants (e.g., thorny rosettes: *Eryngium horridum*) rejected by large herbivorous may play the role of a facilitator to ant communities, by aggregating more species in heavily grazed open grasslands. Densities of ants visiting extrafloral nectaries are triggered by greater resource offer and habitat openness in freshly-burnt grasslands, which might indicate a higher effectiveness of plant defense services against herbivory in these sites, where the risk of herbivore attack is also greater. Taken together the possible implications of these results will be discussed from the point of view of ant communities. (CAPES).

2.2.2 EFFECTS OF ATLANTIC FOREST FRAGMENTATION ON ANT COMMUNITIES AND THEIR BENEFICIAL INTERACTION WITH PLANT DIASPORES

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The Brazilian Atlantic forest is one of the world's biodiversity hotspots, mainly due to the huge degree of habitat loss and fragmentation, faced since Brazil's early colonial period. In this scenario, not only species' persistence matter, but also the continuity of their interspecific interactions and important ecological functions. Here, it was investigated how ant interactions with plant diaspores (seeds and fruits) differed between two contrasting forest types, located in a lower montane region of São Paulo State: continuous forest and forest fragments (N=four sites each). Two complementary approaches were adopted. At first, to characterize ant-fruit interactions in each of the study sites, three 300-m transects were walked, monthly during one year, looking for ant interactions with fallen fruits/seeds. Nearly 1,000 ant-diaspore interactions were recorded, involving 105 plant species and 66 ant species. Overall abundance of ant-attractive diaspores on the ground did not differ between continuous and fragmented forests, but there were significant differences in diaspore richness/composition as well as important oscillations in diaspore abundance among sampling months. These resulted in significantly higher number of interactions in continuous forests than in fragments. For the second approach, a synthetic fruit (i.e., controlling the quantity and quality of available fruits) was used for comparing ant species composition and density, as well as 'fruit' fate (cleaning and removal). In each site, 30 sampling stations were established on the ground, each containing five synthetic fruits. A total of 51 ant species interacted with our synthetic fruits. Continuous forest sites presented a significantly higher number of species per station than fragments. 'Fruit' removal was higher at undisturbed sites, while 'seed' cleaning did not differ between habitat types. Two ant groups ('large ponerines', ≈ 1.5 cm; and 'large *Pheidole*', ≥ 3 mm) were the main responsible for 'fruit' removal, however only the frequency of 'large Ponerines' varied between habitat types, being significantly higher at undisturbed continuous forest. In spite of the opportunistic and generalized nature of ant-diaspore interactions, it was demonstrated that these are markedly affected by Atlantic forest fragmentation. As plant composition changes with fragmentation, the availability of ant-attractive diaspores is negatively affected and the number of interactions decreases in fragments. Moreover, even controlling 'fruit' quality and quantity, ant density and functional groups also responded negatively to habitat fragmentation, resulting in a decline of potential ant services provided to plant diaspores. (FAPESP).

2.2.3 HOW DOES CERRADO HETEROGENEITY AFFECT ANT DIVERSITY IN DIFFERENT LAND USE SYSTEMS?

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Changes in land use strongly influence habitat attributes and can consequently affect diversity and ecological functions. Over the past decades, agriculture has caused a decrease in biodiversity in small or large farms within the Cerrado biome. However, it is likely that agricultural changes affect biodiversity in distinct Cerrado vegetation types in different ways. Further, there is little known about how natural heterogeneity in Cerrado vegetation affects the ant diversity in different land use systems. In this talk, we will show how we evaluated the effect of conversion of three types of native Cerrado vegetation (open grassland, typical savanna, and woodland savanna) to two human-managed land uses (*Eucalyptus* plantations and exotic pastures) on ant richness and composition in arboreal, epigeic, and hypogaeic ant communities. We also demonstrate how the natural heterogeneity in Cerrado vegetation types affects the ant diversity in different land use systems (i.e., which modified habitats receive species from open and closed natural formations). In general, biodiversity was negatively affected by conversion to *Eucalyptus* plantations and exotic pastures regardless of vegetation type. But these impacts do not act in the same way in each ant strata or vegetation type. Grass and herbaceous cover was the most important environmental variable correlated with diversity in open grassland and plant richness and litter diversity were the most important environmental variables for ant species in typical and woodland savannas. Our findings reveal that the magnitude of impact of land-use changes on diversity varies depending on native vegetation type and is associated with the type of habitat attribute change. To summarize these findings, we proposed a guide to show the farmers the importance of ants for the Cerrado conservation to deconstruct misconceptions and myths that they still carry about ants in agroecosystems. (FAPEMIG, CEMIG, CAPES).

2.2.4 THE RESPONSE OF ANT ASSEMBLAGES TO A GRADIENT OF FOREST COVER IN SOUTHWESTERN BRAZILIAN AMAZON

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Human disturbances can affect ant diversity patterns at several spatial scales. At landscape scale, gamma and beta diversities have showed how the shifting of natural habitats to human land-use systems impact ant number of species and species composition. Additionally, ant species present different habitat affinities, such as forest specialist, open-habitat specialist and generalist that can live in both habitat types. These different ant groups can present distinct responses to the same human impact. Southwestern Brazilian Amazon, has experienced high levels of forest shifting to human land-use systems, mainly pastures, since 70-80s. Thus, we accessed the response of ant assemblages to a gradient of forest cover at landscape scale. Specifically, we investigated how gamma and beta diversity, and groups of habitat affinity react to a forest cover gradient in Assis Brasil, AC, Brazil. We carried out the ant sampling in 12 landscapes (circular areas of 785.000 m²) with different forest cover percentage (13 – 100%). In each landscape, we sample ants along transects at the four radials and in each transect, we installed four pitfall traps at ground level (100 m apart). To each landscape, the number of ant species sampled along the four transects was used as gamma diversity and beta diversity (beta = gamma – alpha) was used as proxy of ant species composition. Additionally, we accounted the number of species of each ant groups of habitat affinity, forest specialist, open-habitat specialist and generalist. Gamma and beta diversity increased along the forest cover gradient. The number of species of ant forest specialist increased, open-habitat decreased, and generalist did not changed. Thus, landscapes with few forest covers harbor a small number of ant species, which species have a high distribution leading to a weak difference on species composition within the same landscape. Moreover, forest cover decreasing play a selective effect on ant groups, keeping only the generalist that together with open-habitat specialist probably not play the same ecological roles of forest specialist ant species. Therefore, the reduction of forest cover, at landscape scale, plays a strong simplification on ant assemblage composition, which became less speciose and dominated by generalist species.

(CAPES, NSF – USAID; FAPAC)

2.3 BOSSLESS SOCIETIES: ORGANIZATION WITHOUT CENTRAL CONTROL

2.3.1 HOW DOES A GENERALIST ANT SPECIALIZE? SIZE-INDEPENDENT NEUROBIOLOGICAL AND COGNITIVE MECHANISMS REGULATING WORKER TASK SPECIALIZATION

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Functional specialization leads to efficient organization in complex biological systems. Workers from social insect colonies show task specializations arising without any queen control. In ant colonies with differently-sized workers (polymorphic) nutrition regulates body size which in turn determines task specialization. However, colonies of many ant species with same-sized workers (monomorphic) also show individual task specializations. To test size-independent mechanisms for task specialization in ants, I investigate the neurobiology and cognition of the common tropical ant *Ectatomma ruidum*. In Panama, colonies of this ant species form dense populations allowing workers to specialize as furtive thieves that steal food from conspecific neighbor nests. This provides an excellent opportunity to study how task specialization—being a thief—arises in monomorphic generalist workers. I followed 26 Individuals from 8 different colonies in the field for at least 3 consecutive days. Of the 26 observed individuals, 4 were engaged in more instances of food theft than expected based on the overall occurrence of the behavior; 5 individuals engaged in more instances of other tasks than expected based on the overall occurrence of the behavior. The remaining 17 individuals were not statistically specialized. The proportion of theft behaviors correlated with the number of positive experiences while engaging in food theft, suggesting that experience might play a role in theft specialization. Then I experimentally test two proposed models for task specialization in social insects: The repertoire expansion (RE) model and the self-reinforcement (SR) model. The RE model posits that workers ‘specialize’ temporarily as they transition between tasks with age. In contrast, the SR model predicts that workers specialize based on individual experience by the coupling of conditioned stimuli, for example food, and visual unconditioned stimuli. I investigate whether neural investment, such as neurogenesis or microglomeruli densities, and neuromodulator titers (responsible for behavioral states) change due to worker age or experience by using individuals observed in the field and laboratory.

2.3.2 SOLITARY BUT NOT ALONE: COLONY EFFECTS OF HAVING NESTMATES CONFLICTING WHILE PERFORMING A SOLITARY TASK

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Animals living in societies have the advantage of collaborating to perform tasks that are impossible to achieve solitarily, but may get into a work-conflict when they interfere with others performing a solitary task. In field colonies of *Pseudomyrmex spinicola*, work-conflicts delayed foraging decisions, but increased the chances of storing food instead of dropping it. Work-conflicts were also studied in colonies of leafcutter ants (*Atta colombica*), we tested whether learning about a harmful plant for the mutualistic fungus affected the probability of two workers conflicting about a leaf fragment. One week before recording the observations, all colonies were fed with leaves from two species: in half the colonies (“trained colonies”), one of the two leaf options was treated with a fungicide to train ants to reject that type of leaf (“harmful” leaf), while the other half of the colonies received the same plant species but it was never treated with fungicide (“control colonies”). We observed ants on the first and eighth week after training, offering them fungicide-free leaf fragments of both types (harmful and harmless). Conflicts doubled the time to decide about the leaf fragments, one and eight weeks after training. Decisions about the harmful plant were made more than twice as slow than for the harmless option in the trained colony, but not in the control colony. Besides, the longer the manipulation time of the fragment (before picking it up) the higher the probability of conflicts during the eighth week, but not during the first week. Time in conflicts was similar among plant types and treatments during the first week, but by the eighth week, conflicts about fragments of the harmful leaf lasted almost twice in trained colonies than those leaves in control colonies, and four times longer than harmless leaves. Although conflicts delayed task-execution, the probability of discarding the potentially harmful leaf did not increase in any week. By week eight, conflicts increased the probability of storing the harmless leaf fragments in the treated colonies more than in the control colonies. Having work-conflicts may force the deciding worker to consider its options better, and delays the execution of a potentially bad decision.

2.3.3 SOIL NUTRIENTS INFLUENCE COLONY SIZE AND COLLECTIVE BEHAVIOR IN THE AZTECA-CECROPIA MUTUALISM

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The symbiosis between Azteca ants and Cecropia trees is one of the most successful and prominent mutualisms of the neotropics. Plants provide food bodies and nesting cavities for ant colonies that protect the plant from herbivores and encroaching vines. However, some colonies are consistently more aggressive than others in a suite of behavioral traits measured in the field, revealing that colonies themselves have personalities. What is driving the differences in personality types? We designed an experiment to test whether collective personality is a fixed, inherent property of the colony or if it is influenced by soil nutrients. We conducted a three-phase experiment where we 1) assessed colony behavior in the field, 2) harvested trees, extracted colonies, and transplanted them into greenhouse plants under differing nutrient treatments, and 3) re-assessed colony behavior 10 months later. We show that the structure of the behavioral syndrome shifts when colonies are transplanted to the greenhouse. Furthermore, soil nutrients correlated with colony personality in the field, but did not influence most colony behaviors in the greenhouse despite substantially increasing resource abundance. Soil nutrients likely interact with other environmental factors to structure their behavioral syndrome in the field.

2.4 DISTURBANCE AND ANTS PATTERNS AND MECHANISMS

2.4.1 ANT RESPONSES TO GRAZING IN TROPICAL SAVANNAS OF NORTHERN AUSTRALIA

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Grazing by native and/or introduced mammalian herbivores is a ubiquitous disturbance in tropical savannas, and at high intensity can have a major impact on ecosystem structure and function. In our presentation we will describe responses of ant communities to grazing by cattle in Australian savannas. Ants have been widely used as bio-indicators of the ecological impacts of grazing, and a recent review identified four global patterns of ant response: (i) Soil and vegetation type have a far bigger impact on ant community composition than does grazing; (ii) Grazing modifies species composition but often not total ant richness and abundance; (iii) A species' response often varies between habitats; and (iv) Between 25-50% of the species that can be statistically analysed are affected by grazing. We test the extent to which these response patterns hold in Australian savannas by describing impacts of grazing on ant communities using cross-fence comparisons of areas of different grazing intensities at Lakefield Station (located 460 km south of Darwin and experiencing 1000 mm mean annual rainfall), and using distance from water as a surrogate of grazing intensity at Henbury Station near Alice Springs (200 mm mean annual rainfall). We will also provide support for the hypothesis that grazing has a greater impact in vegetation of higher complexity, due to a more pronounced effect on habitat structure.

2.4.2 QUANTIFYING FOREST DEGRADATION WITH LiDAR: IMPACTS ON ANT COMMUNITIES AND ECOSYSTEM FUNCTIONS

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The expansion of agriculture has strongly shaped the structure and functioning of tropical forests in the world. Changes in land use and climate increase edge effects and the flammability of forests, causing structural and biotic homogenization, as well as forest degradation. As a consequence there may be severe impacts on the associated fauna, and cascade effects on its ecosystem functions. However, quantifying these cascading impacts on the fauna and identifying its underlying mechanisms is a major challenge. This knowledge is crucial, as tropical forests are increasingly being converted into structurally simpler and less diverse habitats, with consequences still poorly understood. Therefore, in this talk we will present the results of a long-term burning experiment in the Amazonian agricultural frontier where we investigated the impacts of fire on ant diversity and seeds they interact. To investigate possible underlying mechanisms of fire impacts over ant communities, we used Light Detection and Ranging (LiDAR). This is an active remote sensing technique based on the emission of short-duration laser pulses that illuminate a target and measure its three-dimensional location, allowing a 3D visualization of its structures. In February 2019 we sampled ants at three adjacent forest plots (0.5 × 1.0 km): control (C), annually burned (B1yr) and triennially burned (B3yr). Fire treatments had been applied from 2004 to 2010. Ants were sampled in six 30 × 30 m plots in each treatment and in the C (N = 18). In each plot we set 9 pitfall traps distant at 10 m each other, tied at a height of 2 m to the trunk of a tree with dbh ≥ 10 cm. Transect was the unit of analysis. We also set a grid with 25 depots of seeds of the local myrmecochore *Mabea fistulifera*, with 2 m spacing, and over one hour observed ant species interacting with seeds and rates of seed removal and cheating. We did LiDAR scanning on the same sites of each pitfall trap were taken in all plots. The discussion to be held in the talk will relate the results of ant diversity and their interactions with seeds with LiDAR metrics that reflect understory density and heterogeneity. By doing so, we expect to discuss how this integrative and manipulative approach can, along with satellite LiDAR data, can allow the future establishment of cause and effect relationships among different factors responsible for forest degradation, insect fauna and their ecosystem services. (CAPES, PELD/CNPq).

2.4.3 PATTERNS, DRIVERS AND MECHANISMS OF HOMOGENIZATION OF MULTIPLE FACETS OF ANT DIVERSITY IN THE BRAZILIAN CAATINGA

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Biotic homogenization is an emerging, yet prevalent, threat in the current biodiversity crisis. It is the process by which two or more spatially distributed ecological communities become increasingly similar over time, thus rendering ecosystem resilience. This process may relate to different diversity components (e.g., taxonomic, functional, phylogenetic, species interactions), yet most studies have only focused on the taxonomic component. Anthropogenic disturbance and climate change are major threats to biodiversity, especially in seasonally dry tropical forests. Ants play a central ecological role in tropical ecosystems. Here, we analyzed the individual and combined effects, and the underlying mechanisms, of anthropogenic disturbance and increasing aridity on the dissimilarity in taxonomic, phylogenetic, functional ant diversity and on the dissimilarity of interactions between ants and plants (i.e. protection against herbivores of extrafloral-bearing plants and seed dispersal) in the Caatinga. We found individual and combined effects of increasing disturbance and aridity on the dissimilarity of taxonomic, functional and phylogenetic diversity. Increasing disturbance and aridity usually reduced beta-diversity components (i.e., ant communities from arid and disturbed areas were more similar than communities from humid areas). These patterns were mainly driven by the turnover of species, functions and lineages rather than their loss. Meanwhile, increasing disturbance did not affect the homogenization of ant interactions with plants, but increasing aridity did. Interaction dissimilarity decreased in the most arid areas. This decrease was basically driven by a decline in species rewiring, exceeding the effects of the increase in species turnover with increasing aridity. In short, increasing human disturbance and aridity drove a pervasive homogenization of ant communities and their interactions with plants at the landscape level in Caatinga. It is especially concerning the synergistic effect of both aridity and disturbance intensification gradients on biotic homogenization. Such homogenization can reduce ecosystem resilience and thereby increase the risk of drastic perturbations of the ecosystem. Caatinga vegetation will face a challenging scenario since global change projections for the Brazilian semiarid region predict a strong decrease in annual precipitation as well as an increase of human populations that are directly dependent on natural resources exploitation.

2.4.4 PLANT PROTECTION SERVICES MEDIATED BY EXTRAFLOREAL NECTARIES IN BRAZILIAN CAATINGA: THE ROLES OF CHRONIC ANTHROPOGENIC DISTURBANCE AND ARIDITY

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Most terrestrial species occur in human-modified landscapes that are experiencing climate change. In addition to direct impacts on species, both anthropogenic disturbance and climate change can have important indirect effects through changes in species interactions, including the disruption of mutualisms and the ecological services provided by them. Here we investigate how chronic anthropogenic disturbance (CAD) and aridity affect the effectiveness of plant protection services by ants mediated by the extrafloral nectar. Our study was conducted in Caatinga vegetation of Catimbau National Park in northeastern Brazil, which is forecast to receive 22% less rainfall by 2100. In order to avoid confounding effects of variation in plant species composition, we focus on a single species of EFN-bearing plant, *Pityrocarpa moniliformis* (Benth.) Luckow & R. W. Jobson (Fabaceae), which is common and widely distributed in our study area, and it attracts a variety of ants. We documented: i) experimental attack rates on termites, as a measure of predatory activity by ants; ii) nectar volume and concentration; and iii) ant attendance at extrafloral nectaries (EFN). These measures were conducted in 13 plots (50 m × 20 m) that varied in levels of CAD and aridity. Predatory activity by ants declined with increasing aridity but was not related to CAD. The volume of extrafloral nectar declined with increasing CAD but was not affected by aridity, whereas the concentration of extrafloral nectar was not related to either CAD or aridity. The composition of attendant ant species varied with aridity but not with CAD. The effectiveness of ant-mediated protection services in *P. moniliformis* was not influenced by CAD, but it declined with increasing aridity. This decline was mediated by changes in the composition of attendant ant species rather than by changes in the production of extrafloral nectar. Our finding that the effectiveness of ant protection declines with increasing aridity highlights a vulnerability of EFN-bearing plants to climate change through increased herbivory and consequently reduction in plant growth and reproductive success. (FACEPE, CNPq, CAPES)

2.5 MORPHOLOGY RELOADED CONQUERING THE THIRD DIMENSION OF ANT EVOLUTION AND BIOGEOGRAPHY

2.5.1 GHOST IN THE SHELL: NEXT GENERATION PHENOMICS AND 3D CYBERTAXONOMY OF ANTS

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The advent and rise of molecular sequencing and analyses techniques have revolutionized our understanding of evolution. Increasingly, more extensive phylogenomic datasets become available and provide robust reconstructions of all levels of the tree of life. However, the study of phenotypes has remained rather slow and presently suffers from a significant gap of scalability between morphological and genomic data, both in size and acquisition speed. The knowledge of morphological modifications through time is crucial for the reconstruction of complex evolutionary scenarios but such data is scarce and unavailable for most taxa. Recent technological advances have opened new possibilities for interactive and three-dimensional (3D) imagery, of which x-ray microtomography (micro-CT) is the most commonly used. It enables non-invasive, high-resolution, detailed 3D analyses of morphological structures and the digitization of tissues, organs, or whole specimens, but it is also an excellent tool for the virtual examination and dissection of (often rare and valuable) material in order to evaluate and discover new morphological characters of taxonomic or phylogenetic significance. This extraordinary richness of morphological data, as well as novel ways to analyse and present it, open up new possibilities to strengthen the role of morphology within the field of systematics. This talk will give an overview of recent projects employing micro-CT and 3D specimen data for different aspects of systematic and evolutionary biology, and highlight both, opportunities and challenges. We will explore the potential to quickly generate large morphological datasets that can be analysed within an evolutionary or systematic context. 3D surface models are an excellent data source for 3D geometric morphometrics or other quantitative analyses, especially if embedded within molecular phylogenomic frameworks. Such combination of different lines of data will improve our understandings of how ant shape has evolved through time and explore the drivers and consequences of that evolutionary change. Based on examples of current taxonomic works on different genera, such as *Discothyrea* Roger, *Terataner* Forel, and *Zasphinctus* Wheeler, we will also show the potential of 3D specimen data to greatly advance collections-based research in general and taxonomy in particular through new virtual and interactive possibilities of presenting and publishing morphological data. Overall, 3D modelling offers great potential for a future of natural history museums that combines digitization of collections, usage of collections as biodiversity libraries, and creation of virtual and openly accessible 3D natural history collections.

2.5.2 SO LONG, AND THANKS FOR ALL THE FEATURES: IS THE HEAD SHAPE IN *PHEIDOLE* MODULAR AND IS IT PREDICTED BY FOOD PREFERENCE?

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Among social insects, mandibles are a fundamental and highly specialized tool. Ants use their mandibles for a wide diversity of tasks strongly related to substrate manipulation, brood transport, food processing, and defense. Despite the constraints involving the basic colony function, ants developed a remarkable diversity of mandibular forms, often related to specific functions such as specialized hunting and seed milling. These modifications and the mandibles themselves should not be understood as an isolated feature, but rather as a component of ant head shape. In this sense, ant heads bear the muscles associated with mandibles, promoting the opening and closing movements and absorbing all the strength required by this important apparatus. However, variation patterns of these traits in a morphological space, the tendency to varying jointly, the evolutionary dynamics and processes that led these morphological diversity remains unknown. Among ant genera, *Pheidole* can be considered a model group of organisms due to its inordinate diversity, wide distribution and peculiar morphological characteristics. It is worth mentioning the presence of an extremely specialized sub-caste known as major workers that generally have a more robust body and a larger head compared to the minors. These morphological differences reflect the division of labor in the colony. Minors are primarily responsible for the brood and queen care, colony maintenance, and foraging, whereas majors are primarily responsible for the nest and resource defense and food processing, often also related to food transportation. This plasticity in colonial activities related to morphology can have a direct relationship with its prevalence in the environment. Considering these morphological specializations, our proposal is focused on understanding how the mandible and head shape vary within and between *Pheidole* sub-castes. Also, we intend to explore how these parts are integrated, and how behavioral factors influence these features. For this, we used geometric morphometrics methods due to its robustness to access morphological information, given that it is easily accessible, replicable, and measurable. Our preliminary results show a directional variation related to the major's mandible, with two different main shapes, whereas in minors this trait varies randomly in the morphospace. In both cases, mandible shape is strongly correlated with head shape, such that the shape can be understood as an approximation of the muscular disposition. For our next steps, we will focus on understanding how feeding and nesting habits can be correlated with these morphological patterns. (CNPq, CAPES, OIST).

2.5.3 MANDIBULAR REPORT: 3D COMPARATIVE ANATOMY INFORMS THE EVOLUTION OF ANT MANDIBLES AS MULTIPURPOSE TOOLS

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Biomechanical innovations can trigger diversification by opening up new ways in which organisms function in their environment. Ants, a megadiverse group of insects that dominates terrestrial environments, have evolved a remarkable range of behavioral and biomechanical adaptations associated with many ways of making a living. This ecological diversity is enabled in part by the diversity of their mandibles—the primary tools ants use to interact with the world. However, the factors that underlie the exceptional morphological and functional diversification of ant mandibles are not well understood. We show that ants have evolved a novel sliding joint that confers an additional angle of rotation during mandible opening/closing; a motion not possible with typical dicondylic insect mandibles. This twisting motion allows ant mandibles to bite when closing but to efficiently grasp and carry large objects when opening, a key advantage for social life that depends on central place foraging and group rearing of offspring. Furthermore, the angle of the sliding joint is adjusted across ant lineages to produce different twisting movements, leading to an expanded range of mandible motions in ants when compared to other insects. This diversity of motions reflects the diversity in mandible adaptations observed in ants, from vibrational leaf cutting to power-amplified trap-jaws to the giant fishhook grasping mandibles of army ant soldiers. Our findings exemplifies how a relatively modest biomechanical change, in this case the modification of a socket to a groove, can facilitate the massive evolution of biological novelty.

2.5.4 ALTERED STATES: ACULEATE ANATOMY AND THE EARLY EVOLUTION OF THE FORMICOIDEA

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Two hundred million years ago, there were no ants; one hundred million years ago, ants were diverse and numerically abundant in some locales; today, virtually no seasonally warm habitat is without Formicidae. How have ants come to be so dominant, to fill so many ecological niches? When did they attain the morphological adaptations which facilitated their radiation, and what did the ancestors of the major clades look like—what did they probably do? Here, we take a wide view of ant evolution, combining a dataset of > 450 morphological characters and genomic ultraconserved element (UCE) sequences to answer questions about the origin and evolution of the Formicidae in the context of the Aculeata. Via total-evidence tip-dating phylogenetics and ancestral state estimation, we trace ancestral morphologies through time from the ur-aculeate to the total clade of the Formicoidea, providing a new perspective on the branching sequence and paleoecology of the extinct ant subfamilies into the crown of extant lineages. The “third dimension” in our study is time, and we take a hopeful view on the future of applied 3D technologies for reshaping our conceptions and models of morphological evolution.

2.5.5 THE ARRIVAL: COMMUNITY ASSEMBLY THROUGH IN SITU ECOMORPHOLOGICAL RADIATION AND NICHE SHIFTS AFTER COLONIZATION OF AN OCEANIC ARCHIPELAGO

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Biologists have long sought to understand the ecological and evolutionary dynamics of island community assembly, and the study of remote island biotas has been particularly informative for generating and testing theoretical frameworks. While reconstructing the dynamics of colonization and post-colonization eco-evolutionary changes has long been a challenge, emerging next-generation technologies for molecular and morphological analysis offer new data streams that can be brought to bear on the problem. Here, we test hypotheses for the ecological and evolutionary assembly of the community of miniature trap-jaw ants (Formicidae: *Strumigenys*) in the Fiji Islands by integrating large-scale collections, phylogenomics, population genomics, and x-ray microtomography/3D morphometrics in a comparative framework. We test hypotheses for whether the ecomorphological diversity in the archipelago is assembled primarily through colonization or post-colonization radiation, and whether species show ecological shifts toward niche specialization, toward upland habitats, and decline in abundance after colonization. The latter three predictions arise from the taxon cycle model of island biogeography, which was originally proposed in this same system. Despite being assigned to several different Asian and Australasian species groups, we found that most Fijian species are derived from a single colonization from Asia 9-14 Ma followed by in situ cladogenesis. Morphological analysis shows that this radiation of 14 species has extended to much of the global morphospace through in situ radiation, including a shortening of the long trap-like mandibles which indicates transition to more hypogaeic lifestyle. Within the radiation, one clade has trended toward higher elevation and larger body sizes, and we show this is associated with greater geographic structuring and demographic decline. These findings show mixed support for the taxon cycle, with post-colonization trends matching predictions on one hand, but on the other hand there is no evidence subsequent colonists replace the initial radiation, which could demonstrate the strength of priority effects.

2.5.6 A MORPHOSPACE ODYSSEY: QUANTIFYING MANDIBLE DIVERSITY ACROSS THE ANT PHYLOGENY

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Animals primarily manipulate the world with the morphological tools they have evolved. Mandibles as the bite and grab appendages are one of the most important tools for insects. Particularly in ants they have critical functions in maintaining colonies and performing specialized jobs, such as tunneling, grinding, cutting or rapid snapping and trapping. The ant worker mandible shows a myriad of forms, it is integrated in a complex functional system, but large-scale studies how the extreme disparification of form and function behaved in ant evolution are lacking. Quantifying this trait system in an evolutionary context faces requirements in extremely high anatomical detail and additionally, phylogeny, ecology, and performance must be represented. Here I identify homologous features in ant mandibles of all major lineages and show quick ways to digitally dissect morphologies in 3D. By means of geometric morphometrics, I describe their realized morphological space to show trends in mandible evolution. I present an effective workflow to quantify morphology from physical specimen to data output and offer perspectives how functional, phylogenetic, and ecological data can be synthesized for evolutionary analysis using the combined capabilities of imaging systems, software and finally, excellent collection-based specimen sampling. Genes and Development define the animal phenotype. If changes in the phenotype affect the performance of functional morphologies, fitness is affected and the phenotypes are under selection. The associated genes and developmental pathways will then increase or decrease in frequency. In ants, the cycles of selection led to great varieties no matter how you frame them: Biodiversity, behavioral, functional, ecological, or morphological diversity. The backbone to analysing the evolution of diversity is understanding diversity through reliable taxonomy and phylogeny. The approach presented here adds to the next generation repertoire of morphological analysis and parametrization of big morphological data and it is complemented by the ever-improving results from molecular biology. An integration of morphology, phylogeny, function and ecology will offer more explanations to the hows and whys surrounding the evolution of diversity and disparity in ants.

2.6 ORDERING CHAOS WHICH FACTORS EXPLAIN THE VARIATION IN THE OUTCOME OF ANT-PLANT MUTUALISMS

2.6.1 PLANT REWARDS QUALITY MODULATE ANT BEHAVIOR AND THE OUTCOME OF ANT-PLANT INTERACTIONS

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Interactions between ants and plants are useful models for investigating how plant traits modulate mutualisms outcomes. As plant-derived resources are essential components of ant diets, plants that offer more nutritious food to ants should be better defended in return, as a result of aggressiveness toward natural enemies. Likewise, the whole structure that emerges from these interactions should be mediated by plant rewards' quality. We tested these hypotheses in two studies performed in Southeastern, Brazil. The first involved a field experiment observing ant behavior and aggressiveness towards potential herbivores (termites). To do that, we added artificial nectaries of different nutritional quality: amino acids, sugar, sugar + amino acids, and water (control), to a plant that does not holds extrafloral nectary (EFN). The second study involved ant interactions with distinct plant resources: EFN, flowers, fruits, and honeydew from trophobiont hemipterans, during one year of monitoring. In the first study, ant recruitment and patrolling were highest when ants fed upon nectaries providing sugar + amino acids, the most nutritious food. This increase in recruitment and patrolling led to higher encounter rates between ants and termites, more frequent attacks, and faster and more complete termite removal. In the second, we have found that, according to resource type, the structure of ant-plant networks are different in terms of specialization and ants' resource partitioning. Our results are consistent with the hypothesis that plant biotic defense is mediated by resource quality. Moreover, our findings suggest that plant rewards quality modulates ant behavior, mediating the way ants interacts with plant, i.e., the structure of interactions networks. Altogether, these evidences highlight the importance of rewards' quality for the outcome of ant-plant interactions. (CAPES, CNPQ, FAPEMIG)

2.6.2 PROTEIN MATTERS: ANTS ARE BETTER PLANT BODYGUARDS IN POOR-PROTEIN HABITATS

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More aggressive and competitive ant species are better bodyguards for extrafloral nectary (EFN) bearing plants. Therefore, any factor increasing the relative value of EFNs to ants should benefit the plants, as it would increase the plant's probability of interacting with more aggressive ants. We hypothesized that the frequency of plant attendance by more aggressive ants and the efficiency of plant defense by ants will be higher when the availability of carbohydrates and/or proteins is low to ants. We established 19 plots with five focal plants from the EFN-bearing species *Turnera subulata* per plot. For each focal plant, we recorded the identity of the attending ants and its efficiency in removing simulated herbivores from the plant. In each site, we estimated the biomass of soil arthropods and the number of apical meristems with active EFNs as proxies of protein and carbohydrate availability, respectively. The probability of interacting with more aggressive ant species was not influenced by the number of meristems with active EFNs nor by arthropod biomass. However, simulated herbivores were removed more frequently in plots with lower arthropod biomass. This suggests that overall ant aggressiveness towards other arthropods increases in protein-poor sites, potentially increasing the efficiency with which EFN-plants are defended against herbivores. (CAPES, FAPESP)

2.6.3 WHAT CAN WE LEARN FROM SEED-REMOVAL BY ANTS IN THE CERRADO?

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Land-use changes strongly affect habitat attributes resulting in a range of disturbed and modified ecosystems with negative consequences for ecological process. There is insufficient information whether the effects of different land-use changes on ecological process, as seed removal, vary according to original vegetation types. Such information is crucial for the Cerrado that presents a natural heterogeneity in terms of vegetation types and has been drastically converted to different land uses. In this talk, we will show how land-use changes (planted pasture and *Eucalyptus* plantation) affect seed removal by ants in three Cerrado vegetation types (grassland, savanna and savanna-forest). We expected greatest difference in seed-removing ant composition and percentage of seed removal where the habitat attributes most differ between converted and original habitats. In each habitat type, we hand-collected seed-removing ants and sampled some habitat attributes (tree diameter, height, richness, density and canopy cover, soil hardness, litter diversity and dry weight and percentage herbaceous ground cover). In general, we found that land-use changes negatively affect seed removal by ants in all Cerrado vegetation types, and herbaceous ground cover, soil hardness and tree richness were the habitat attributes most correlated to changes in seed removal parameters. We also found that the magnitude of the effect of land-use change on seed removal by ants is mediated by similarity in habitat structure between converted and original habitats. Our results show the seed removal by ants depends on the essential role of habitat structure, mainly on the ground level. We also highlight that degree of effect of land-use changes depends on vegetation type and on the extent of habitat transformation which should be considered for management, conservation and restoration of tropical savannas. (CAPES, FAPEMIG)

2.6.4 DOES SPECIALIZATION OF ANT-PLANT MUTUALISTIC NETWORKS RESPOND PREDICTABLY TO THE CHRONIC DISTURBANCE AND RAINFALL?

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Anthropogenic disturbance and climate change might negatively affect the ecosystem services provided by mutualistic interactions. However, the effects of such forces remain poorly characterized. They may be especially important in dry forests, which (1) experience chronic anthropogenic disturbances (CADs) as human populations exploit forest resources and (2) are expected to face a 22% decline in rainfall under climate change. In this study, we investigated the separate and combined effects of CADs and rainfall levels on the specialization of mutualistic networks in the Caatinga, a seasonally dry tropical forest of northeastern Brazil. More specifically, we examined interactions between plants bearing extrafloral nectaries (EFNs) and ants. We analyzed whether differences in network specialization could arise from environmentally mediated variation in the species composition, namely via the replacement of specialist by generalist species. We characterized these ant-plant networks in 15 plots (20 x 20 m) that varied in CAD intensity and mean annual rainfall. We quantified CAD intensity by calculating three indices related to the main sources of disturbance in the Caatinga: livestock grazing (LG), wood extraction (WE), and miscellaneous resource use (MU). We analyzed the degree of ant-plant network specialization using four metrics: generality, vulnerability, interaction evenness, and H_2' . Our results indicate that CADs differentially influenced network specialization: we observed positive, negative, and neutral responses along LG, MU, and WE gradients, respectively. The pattern was most evident with LG. Rainfall also shaped network specialization, markedly increasing it. While LG and rainfall were associated with changes in network species composition, this trend was not related to the degree of species specialization. This result suggests that shifts in network specialization might be related to changes in species behavior, not species composition. Our study highlights the vulnerability of such dry forest ant-plant networks to climate change. Moreover, dry forests experience highly heterogeneous anthropogenic disturbances, creating a geographic mosaic of selective forces that may shape the coevolution of interactions between ants and EFN-bearing plants. (CAPES, CNPq, FACEPE, RUFFORD).

2.7 ADVANCES IN STUDYING ANT EVOLUTION FROM AMBER INCLUSIONS TO COMPLEX SYMBIOTIC RELATIONSHIPS

2.7.1 EVOLUTIONARY HISTORY OF YEAST AGRICULTURE IN FUNGUS-GROWING ANTS: A PHYLOGENOMICS APPROACH

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Evolutionary innovations allow species to access new ecological niches. The cultivation of fungi for food opened an entirely new nutritional niche to the ancestor of all fungus-growing ants. Among the fungus-growing ("attine") ants, yeast agriculture, which evolved more recently, is practiced solely by a subset of species in the genus *Cyphomyrmex*, the *Cyphomyrmex rimosus* group, and remains perhaps the least understood of the five ant agricultural systems. The "yeasts" cultivated by *C. rimosus* group are not true yeasts, but rather an agaricaceous fungus that grows as a unicellular morph when it is associated with the ants. Because yeast gardens consist of masses of yellowish clumped and encapsulated nodules, it has been suggested that the yeast morph may have emerged as an evolutionary strategy for resisting fungal pathogens. Interestingly, the yeast fungi are known to occur apart from the ants in a free-living, mycelium-producing, mushroom-forming phase and cultures in axenic, nutrient-rich medium revert to a mycelial phase similar to fungi grown by other species of fungus-growing ants. Understanding the relationships of both the yeast-cultivating *C. rimosus* group ant species and their fungi is critical for understanding the key evolutionary event in which a typical, mycelium-farming ancestor began cultivating a yeast-morph fungus. Thus, reconstructing the sequence of evolutionary events that produced this transition requires explicit phylogenies for both symbionts. With the advent of methods for sampling the genome, we can now properly delimit species boundaries for both symbionts. Genome-scale sequencing of ultraconserved elements (UCEs) has proven decisive for reconstructing fungus-farming ant and fungal phylogenies. Our study constitutes the first molecular phylogeny of the *Cyphomyrmex rimosus* group. Our dataset is composed of UCE data from 171 ant taxa in the *rimosus* group and 31 ant-associated fungal samples. Preliminary results indicate that UCEs are effective for: (i) delimiting ant species and identifying cryptic species in groups or complexes that have challenged morphology and (ii) delimiting ant-cultivated fungal species and clades, for which only a handful of markers were available previously. (ASU, NSF, SI)

2.7.2 SYMPATRIC VERSUS ALLOPATRIC SPECIATION: EXPLORING THE ORIGINS AND EVOLUTION OF SOCIAL PARASITISM IN ANT

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Understanding the origin and maintenance of biological diversity is a priority in evolutionary biology. Allopatric speciation, the divergence of species resulting from geographical isolation, is universally accepted. In contrast, sympatric speciation, the divergence of species in the absence of geographical isolation, is controversial, because, for speciation to occur in sympatry, strong diversifying selection needs to be correlated with reproductive isolation in the presence of gene flow. Despite these narrowly defined conditions, sympatric speciation has been inferred for the evolutionary origins of a few ant inquiline social parasites. Social parasitism, defined as the parasitic dependence of a social species on another for survival and reproduction, is a highly successful life history strategy in eusocial insects and in ants alone, more than 340 species of social parasites are known. To detect generalizable patterns across independently evolved parasites, I employ an integrative approach, consisting of phylogenomics, population genetics, taxonomy, and natural history to comparatively study the speciation patterns and evolutionary history of social parasitism in ants. In this presentation, I will contrast speciation mechanisms inferred for the inquiline social parasites in the fungus-growing ant genera *Acromyrmex* and *Mycocepurus*, with novel results obtained for social parasites in the formicine ant genera *Formica* and *Nylanderia*. Inquiline social parasites of fungus-growing ants evolved at least four times convergently and sympatric speciation is directly evident for at least three inquiline species. In contrast, a workerless inquiline social parasite in the genus *Formica* evolved from a temporary social parasite ancestor likely via allopatric speciation. The results demonstrate that highly similar socially parasitic life histories evolve via independent evolutionary pathways across the ant tree of life. (ASU, NSF)

2.7.3 TOOLS FOR STUDYING ANT INVASION BIOLOGY—POPULATION GENETICS AND PHYLOGENOMICS MEET APPLIED ENTOMOLOGY

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The taxonomic instability among globally-invasive ants is a real-world problem that needs to be addressed at multiple levels. Molecular tools are needed to reconstruct biogeographic histories, identify species- and population-level units, and stabilize nomenclature. Many ant species are difficult to associate with stable names because of chaotic underlying taxonomy, particularly in morphologically uniform, species-rich groups. We tested the ability of Ultraconserved Elements (UCEs) to resolve overlapping phylogenetic and taxonomic problems, simultaneously at multiple levels, in the ant genus *Nylanderia*, which has a history of taxonomic confusion. *Nylanderia* contains more than 130 described and an estimated 100 yet undescribed species. More than a dozen species have widespread exotic ranges; nearly all are plagued by uncertain names, species boundaries, and region of origin. Our first goal was to understand the biogeographic history of the genus, so we reconstructed and dated the first global phylogeny of *Nylanderia* using representatives spanning all seven biogeographic regions in which the genus occurs. Our results confirmed the monophyly of the genus and identified four distinct biogeographic clades—Nearctic, Australasian, Afrotropical, and Neotropical. The stem origin was reconstructed as mid-Eocene (~44.6 mya, Palearctic) and the crown group dated to the Oligocene (~32.8 mya, Indomalaya). Second, we asked how many lineages gave rise to globetrotting species. Our global phylogeny indicates that the nine widespread exotic taxa arose from six independent lineages originating in three biogeographic regions. Finally, we tested the integrity of species boundaries for six difficult-to-diagnose widespread exotic taxa. Our results suggest that two pairs of morphologically similar species, *N. bourbonica* + *N. vaga* (Indo-Australia) and *N. fulva* + *N. pubens* (Neotropical), are indeed reciprocally monophyletic, while *N. steinheili* and *N. guatemalensis*, are reciprocally paraphyletic. These results demonstrate that a phylogenomic approach using UCEs can help resolve taxonomically challenging groups at multiple scales. *Nylanderia* taxonomy can now advance with a stable phylogenetic framework; this includes resolving names of species with high invasion potential and determining useful morphological characters for species-level discrimination. This approach should be effective across ant taxa, and represents an essential step towards invasive species monitoring and management by stabilizing species identities.

2.7.4 INTRASPECIFIC COMMUNICATION DAMPENS AGGRESSION BETWEEN *MEGALOMYRMEX* SOCIAL PARASITES AND THEIR FUNGUS-GROWING ANT HOSTS

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The fungus-growing ants (Attini: Attina) are among the most complex and well-studied evolutionary radiations because of the obligate symbioses between the farming ants and their fungal food crops. These symbiotic networks—made of species that span phyla—create dynamic patterns of selection, due to the tug-of-war for resources among members. These networks remain stable because interacting species work as a collective to maintain balance and ensure their own survival. I am interested in host-parasite relationships and the chemical means of communication and interaction. We explore the chemical and behavioral ecology of *Megalomyrmex* parasites. The genus consists of 44 species, a quarter of which use various parasitic strategies (thief ants, agro-predator raiders, guest ants) to exploit fungus-farming ants. The best-studied system includes a guest ant species that is a context-dependent mutualist. *Megalomyrmex symmetochus* (a.k.a. mercenary ants) has evolved to protect their fungus-growing ant host (*Sericomyrmex amabilis*) from a more lethal ant parasite (<https://megalomyrmex.osu.edu/videos.html>). This is driven by the parasite's potent alkaloid venom, a weapon that is deadly against intruders but is also used to pacify host ants. The chemical profile of the hosts and parasites, as determined by gas chromatography-mass spectrometry, showed that the parasite's cuticular hydrocarbon profile is muted and simplified compared to the host's. Still, the host can clearly identify the invader. We conclude that the parasite venom is not only detected by the host ants but dampens aggressive interactions. Thus, it is used as a signal to warn the host ants of the parasite's lethal threat. This interspecific communication allows both host and parasite ants to minimize the cost of their association.

2.7.5 HOMOPLASY AND HETEROGENEITY IN ANT EVOLUTION: EXAMPLES AND INSIGHTS FROM THE ANT TRIBE CAMPONOTINI

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Molecular phylogenetic methods have greatly advanced our understanding of the evolutionary history of ants. Reinterpretation of ant morphology and social behavior in the light of these improved phylogenies has highlighted considerable heterogeneity in the tempo and mode of ant evolution. Since their origins in the late Cretaceous and early Tertiary, the major lineages of ants have experienced disparate levels of diversification and divergence. There has also been frequent independent evolution of similar anatomical and social attributes in different clades. These phenomena are examined and interrogated, with a focus on ants in the tribe Camponotini. Here there are multiple examples of related groups that vary in diversity and morphological disparity. *Camponotus*, for example, is one of the world's largest ant genera, with over 1,500 described species and subspecies, distributed collectively over all major land masses, and displaying a wide range of morphological and ecological characteristics. Recent phylogenomic research, employing ultra-conserved element (UCE) sequences, demonstrates that the sister group of *Camponotus* is a small cluster of three species-poor genera confined to the Indo-Australian region. Within *Camponotus*, all of the Neotropical representatives appear to belong to a single clade, some species of which are notably convergent in morphology with Old World taxa. Members of a distantly related camponotine genus, *Colobopsis*, also show an uncanny resemblance to certain *Camponotus* species. All camponotine ants harbor obligate, vertically inherited endosymbiotic bacteria (*Blochmannia*) that appear to provide important nutritional benefits to their hosts. The role of these symbionts in the diversification of camponotine ants is discussed.

2.8 BRIDGING SOCIETIES POSSIBLE PATHS TO GATHER ANTS, PEOPLE, AND KNOWLEDGE

2.8.1 WHY WE SHOULD PROMOTE MYRMECOLOGICAL RESEARCH FOR THE GENERAL PUBLIC

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Science is an integral part of society, but it is only in recent years that the discussion on the impact of university research on the public has gained strength. Sharing the results of a work, as well as clarifying the process of scientific development with the public at large, can help solve a number of local and global challenges, and build an open and inclusive space. Improving the culture of scientific dissemination does not require great efforts and resources. However, more than one million scientific articles are published each year, making this process increasingly complex. Therefore, it is increasingly important to find ways to highlight progress in the advancement of our research. Recently, organizations around the world made a series of changes to improve their outreach channels, showing how science and research can contribute with the process of formation and sustainable development of society. Looking at the Brazilian myrmecology laboratories, the intention here is to discuss the state of the art of scientific dissemination in Brazil and its impact on the general public, academia, social media, funding agencies, and governments, and in the public and private sectors. (CAPES).

2.8.2 MYRMECOLOGY AND CITIZEN SCIENCE: INITIAL APPROACHES

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Open Science, which includes everything from the free availability of research results to the valorization and direct participation of non-scientists and non-specialists in science, citizen science itself. Citizen science can be defined as scientific research conducted, in whole or in part, by amateur or non-professional scientists, which includes both the search for contributions of different types by non-scientists for research efforts and initiatives aimed at expanding social participation in the direction of science. Many of the citizen science projects do not require specialization, depending only on human perception and brief training. In spite of flexibility, in most cases citizens act exclusively as data collectors, not actively participating in the planning or data analysis phases, which is why we highlight in this work an experience where the population of a quilombola community that participated in a multidisciplinary research on the environmental history of the eastern region of Minas Gerais, where the use of ants as indicators of environmental recovery added to interviews and documentary data. Throughout the research the residents of the community of Ilha Funda, in Periquito MG, initially contributed to the definition of the areas of collection and installation of the traps. After the laboratory work researchers sought the mediation of a professional who provides technical advice to the community to adapt the language and presentation of the data so that the same could be easily understood by the residents of the community. Then the data (richness, abundance and species composition of each area) were presented to the residents who finally contributed to their interpretation. We emphasize the empirical knowledge of volunteers for the identification of environmental characteristics, particularly the history of land use and occupation, for understanding the data. It is likely that this exchange between researchers and community is not new to many myrmecologists, but what is intended here is the recognition of the importance of citizens as part of the process of producing scientific knowledge, and therefore also as co-authors of many of our researches and the possibility of breaking limits in the production of this knowledge. (FAPEMIG)

2.8.3 THE ANT AND THE GRASSHOPPER: COMBINING ARTS AND SCIENCE FOR A WIDER PUBLIC OUTREACH

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Scientists are often challenged to disseminate scientific results to the main public. This demand make sense. After all, in most of the time it is the society that bears the costs of research. However, the vast majority of scientists do not communicate their results out of the academic circle, and it is easy to understand why. Nowadays the amount of information available is astounding. Anyone can create “quality” audio-visual products in their home and make it available on the internet. Consequently, communicators struggle to capture people’s attention. How then, to present scientific knowledge to the general public? One alternative is to associate with other areas of culture. The communication power of arts is much greater than that of science and has been under-exploited by the scientific community. In this presentation I will show three examples based on ant biology, of how arts and science can be combined to increase communication and reach a larger audience. Moreover, I will show that the traditional sequence, where the “scientific fact feeds the artist’s creativity” is not the only way. It is possible that art also nourishes science. Active engagement between science and arts will be essential to successful communication and also innovation. (CNPq)

2.8.4 WHAT DOES COME TO YOUR MIND WHEN YOU THINK ABOUT ANTS?

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Mymecologists know the high diversity of ants, the ecological functions they perform and their importance for the maintenance of ecosystems and for conservation. However, outside the academic environment, the ecological relevance of ants is not recognized in the same way, since usually ants are seen as plagues or misfortune in the routine of the people. In this way, we feel an extreme need to discuss the knowledge generated in academia and how to popularize it among other sectors of society, and we have realized how much we can advance in the knowledge about these organisms when we combine popular and scientific knowledge. Therefore, this talk intends to present tools found by Ants Ecology Laboratory at UFLA to demystify the role of ants through dialogue, information exchange and by the production of materials on scientific and popular knowledge about these organisms. We also aim to discuss and problematize the way in which scientific knowledge has been produced, presenting experiences of recognition and exchange of knowledge that we carry out and intend to carry out. The graduate students of the afore mentioned laboratory are strongly encouraged to have at least one product of scientific communication and / or a proposal to involve popular knowledge about ants (ethnomirmecology) in the elaboration of their research projects, facilitating the exchange between scientific and popular knowledge. In general, our work is carried out in the understanding of the need to disseminate scientific knowledge about ants to various social actors (students from public and private schools, rural producers, surrounding residents and workers from conservation units, people and companies), as also understand, recognize and value their perceptions and relationships with these organisms. By the exchange of experiences between the different actors, we use popular knowledge (as well as we value it) to enrich the elaboration of teaching methods and didactic materials about ants. We will present scientific dissemination booklets, articles on ethnomirmecology and projects under elaboration whose main objective is to recognize and value the ethnomirmecological knowledge of the actors involved and create a space for the dialogue between scientific and popular knowledge. In addition, we aim to develop tools that promote the knowledge about ants and their importance that can be used by various sectors of society, in order to demystify the ants and their functions, as well as to approach the different knowledge. (FAPEMIG, CNPq, CAPES, CEMIG).

2.9 TOWARDS A SYNTHESIS OF ARBOREAL ANT ECOLOGICAL RESEARCH IN THE TROPICS

2.9.1 A RESOURCE BASED APPROACH ON THE STUDY OF ARBOREAL ANTS

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Arboreal ants are responsible for a large part of the biomass of tropical environments, with striking levels of diversity and abundance. Moreover, arboreal ants are involved in a high number of interactions in the tree canopies, from obligate-mutualisms with plants to interspecific competition with other ants. With such important features, arboreal ants have been intensively studied, and some important patterns were observed, generating classical concepts of ant ecology. However, even after all these years, there are still some open issues in the study of tropical arboreal ants. Here, I show data from around 10 years of study on arboreal ant communities in Brazilian savannas (i.e. Cerrado), and discuss some approaches over resource use in canopy ants. On this decade of research effort, me and my colleagues collected data from over a thousand individual full grown cerrado trees (i.e. around five meters tall). Importantly, to answer these questions we always mixed traditional sampling methods (i.e. arboreal pitfalls) with experimental approaches, in a way to get a more complete picture of the scenario of arboreal ant communities. First, I focus on the potential effects of food resource utilization on species assembly and community organization, and then I will move to the effects of shelter resources utilization. I specifically asked the following questions: A) Is there a significant impact of extrafloral nectaries (EFNs) on the organization of Cerrado arboreal ant communities? B) Is there a trade-off between the ability to find and dominate food resources (i.e. discovery-dominance trade-off) in the Cerrado canopy? C) How important are shelter resources for Cerrado arboreal ant species assembly and community organization? Overall, the results showed a limited influence of food resources on community organization and species assembly in Cerrado trees. Furthermore, we did not detect a discovery-dominance trade-off, since the first ants to arrive at a food resource were usually to ones to control it (i.e. discovery-defense strategy). On the other hand, by performing an experimental manipulation, we detected a significant effect of shelter resources heterogeneity on arboreal ant species diversity patterns. This studies highlight the importance to look deeper in the resource utilization patterns by arboreal ants, that may be directly to the high diversity patterns observed on the trees. (NSF, CAPES, CNPQ).

2.9.2 EXPLORING THE ECOLOGY OF ARBOREAL ANTS IN A TROPICAL FOREST

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Tropical forests canopies harbour a great abundance of ants, that compounds the major part of arthropod biomass of these habitats. There is evidence of “ant mosaics” on treetops, probably shaped by competition among dominant ants. Despite that, it is known that the canopy presents a high ant species richness. Therefore, the understanding of how canopy ant communities are structured, and how they partition space within the trees are exciting aspects of ant ecology. In this context, we sampled ants on trees within six circular plots (0.28 ha), at *Los Tuxtlas*, a Mexican tropical forest. Our objectives were: (1) What is the force that structures the ant community on the forest canopy? (2) Which factors determine the ant spatial dominance? (3) How the canopy and understory networks of ant-plant co-occurrences are structured? For the first objective, we assessed the results of competitive interactions of ants at food resources. The preliminary results indicated that the discovery-dominance trade-off is not the most important structuring factor of the canopy ant community. For the second objective, we installed several baits within trees (up to 8 sampling points per tree). On each of these sampling points, we measured some environmental variables (microhabitat conditions) that could determine ant species composition. We found that baits on lower heights from above the ground had a higher probability of being used, which could be related to greater availability of routes and the easiness to be used by ant species from either the top or closer to the ground. None of the environmental variables measured determined ant species composition, with dominant ants’ accessing resources independently of ant species and microhabitat. We found that taller trees, with greater richness and abundance of epiphytes, lianas and other plants, had lower spatial dominance, given, mainly, by its higher spatial heterogeneity. For the third objective, we performed paired samples in all canopy trees and understory shrubs within the plots and built co-occurrence networks among ants and plants of each vertical strata. We found that the species composition of plants and ants differed between canopy and understory. Meanwhile, we found that the networks of each vertical strata were very similar in structure (network size, specialization, modularity, and nestedness), but with a higher interaction diversity in the understory than in the canopy. Our results suggest that ants use the resource in a generalized way, independently of the microhabitat or habitat conditions, and the identity of ant species. (CONACYT, INECOL)

2.9.3 ANTS AND THEIR ECOSYSTEM SERVICES IN MEXICAN AGROECOLOGICAL SYSTEMS

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Arboreal ants are ubiquitous organisms in tropical agroecosystems. Although ants are often viewed as harmful in farms (due to the mutualistic relationships ants form with hemipterans, common agricultural pests), ants are important predators in several agroecosystems, including coffee. Ant communities can be strongly affected by agroecosystem management that alters availability of resources (e.g., prey) and microclimatic conditions (e.g., temperature) and by interactions with parasitoids (e.g., phorid flies). We examined the role of ants as providers ecosystem services within coffee agroecosystems and specifically ask how changes in available resources, microclimate factors, and presence of parasitoids affect predation services provided by ants. We worked in shaded coffee agroecosystems in Chiapas, Mexico to understand ant interactions with the coffee berry borer (*Hypothenemus hampei*). We conducted a series of experiments to test predation under a variety of conditions. First, we tested ant predation on the borer to identify important predatory ant species. Second, we conducted seasonal observations, a rainfall enclosure experiment, and stable isotope analysis to test how temperature and seasonal differences affect predation and diets. We conducted an experiment to test whether adding vegetation connections facilitates removal of pest species from coffee plants. Finally, we examined how presence of phorid parasitoids and ant diversity influences pest-predation. Several species of arboreal ants in the genera *Azteca*, *Pseudomyrmex*, and *Procryptoerus* are efficient borer predators. We found that certain ant species remove more borers during the dry season, however, limiting rainfall did not increase borer removal, likely due to higher prey availability and more protein in the diet in the rainy season. Activity of one predator, *Azteca sericeasur*, increased with vegetation connections and borer removal was three times higher on connected plants. Greater distance from the nesting tree negatively influenced ant activity on control coffee plants, but not on connected plants, suggesting that connections could compensate for more intensive management with fewer trees. Finally, presence of phorid flies significantly reduced effectiveness of *Azteca sericeasur* as a predator, however, phorid presence also revealed synergistic effects of ant diversity, not observed without presence of this parasitoid. Thus, a parasitoid-induced predator behavioral change revealed the importance of functional redundancy and predator diversity for control of this important pest. In sum, both abiotic factors such as temperature and vegetation connections as well as biotic factors such as prey availability, presence of parasitoids and ant diversity can strongly affect the role of arboreal ants as predators in agroecosystems. (NSF, USDA)

2.9.4 THREE-DIMENSIONAL ANT DISTRIBUTION IN RAINFORESTS AND A METHOD TO DETECT ANT MOSAICS

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It is not easy to observe and/or gather the ants living tropical rainforest canopies due to the difficulty in accessing tree crowns. Among them, some territorially-dominant arboreal ant species (TDAAs) are spatially segregated forming “ant mosaics” of territories. Classical sampling methods attempting to document arboreal ant distribution in tropical forests require climbing trees and are time-consuming. In addition, competition or association between ant species are inferred indirectly. Our aims were to: (1) develop a rapid assessment protocol (the Standardized Baitline Protocol, hereafter SBP) allowing TDAAs, associations between them and their three-dimensional colony extension to be detected; and (2) to evaluate the SBP in terms of coverage of the local ant assemblage. In the SBP, tuna and honey baits are spread every 5m along a rope twined around tree trunks on all upper canopy trees present within a circular plot of 30m radius. The extension of dominant ant territories is assessed by conducting aggression tests between ants foraging on the baits. Mutual tolerance between species is evaluated with statistical approaches and with *in-situ* observations on the baits. The SBP was tested in three lowland rainforest sites in Papua New Guinea and compared with a complete inventory of arboreal ants on all trees in a “Whole Forest” (WF) plot of 0.4ha and a subset of it containing only upper canopy trees. We found the following. (1) TDAAs occupied both understory and canopy trees in the WF plot. (2) The SBP collected less than half of the local arboreal ant assemblage. (3) In terms of local ant richness the representativeness of the SBP method declined with the increased dominance of the TDAAs. We present these conclusions. (1) The SBP appeared adequate to rapidly detect TDAAs and ant mosaics, but should be complemented by other methods to document the local ant assemblage diversity. (2) A key advantage over previous methods is the use of behavioural observations to assess species associations and the 3D extension of colonies. (3) The SBP also has potential for monitoring and understanding the dynamics of TDAA colonies and for detecting invasive species or supercolonies. (FNRS, CAS, CNRS, Our Planet Reviewed Papua New Guinea)

3

ORAL & POSTER ABSTRACTS

3.1 BIOINDICATION, BIOINVASION, PEST CONTROL, SCIENCE OUTREACH AND ETNOMYRMECOLOGY

3.1.1 RICHNESS AND COMPOSITION OF ANTS IN REMANENTS OF NATIVE HABITAT AND AGRICULTURAL SYSTEMS IN THE STATE OF MATO GROSSO – BRAZIL

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The modification of natural habitats resulting from the expansion of agricultural areas has affected biological communities, causing loss of biodiversity and imbalance in ecosystem services. Studies that evaluate the impacts of this process on key taxonomic groups for the maintenance of ecosystem services are very important both for the development of adequate landscape restoration strategies and for understanding the contribution of these groups to increasing agricultural production. The ants comprise an abundant group with high diversity, occupy different niches, are easy to sample, and respond to environmental pressures being excellent indicators of environmental quality. This work aims to compare the richness and composition of ant species in native habitat and soybean (*Glycine max*) areas. 42 points were sampled in eight municipalities in the state of Mato Grosso, Brazil. At each site, 18 *pitfall* traps were installed (nine in the native habitat and nine in the soybean plantation). Our results show that, of the 179 species collected, 167 were recorded in native habitat areas and only 67 in soybean cultivation. Of these species, 111 were collected exclusively in natural habitat and only 11 in the soybean crop. Likewise, the number of occurrences of the species found in the natural habitat was higher than the soybean crop with 3726 and 639, respectively. The composition of species was also different between natural areas and cultivation. With

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predominance for the species *Pachycondyla crassinoda* registered in 61% of the native habitat areas and stand out as indicators of preserved and ecologically stabilized areas. In the soybean area the dominance was of *Dorymyrmex brunneus*, which may present an important function in the crop, since they are predators and prefer open environments. Our results highlight the importance of natural areas to maintain biodiversity in agroecosystems and ensure the maintenance of ecosystem services of agricultural importance. (FAPEMAT, CAPES)

3.1.2 COMPOSITION AND DIVERSITY OF FORMICIDAE IN A NATURAL FRAGMENT IN QUIRINÓPOLIS – GOIÁS

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The study of Formicidae give an image about the situation of the environment that is being evaluated, it presents great structural complexity and sensitivity to the changes of the environment. The objective of this study was to inventory the richness of ant fauna in a *natural* vegetation located on the *Fazendinha* farm in Quirinópolis GO, an area where the surrounding vegetation is pastureland e sugarcane monoculture. To carry out the work collections were used 33 pitfall traps, per 48h and active collection to be taken in natural hike. The collections were carried out from November 2018 to February 2019. In total, 407 individuals were collected, distributed among 22 taxa, including seven subfamilies and fourteen genera *Azteca*, *Ectatomma*, *Camponotus*, *Paratrechina*, *Acanthoponera*, *Heteroponera*, *Atta*, *Cephalotes*, *Crematogaster*, *Pachycondyla*, *Megaponera*, *Odontomachus*, *Neoponera*, *Pseudomyrmex*. The subfamily that presented the greatest diversity of genera collected was Myrmicinae. This predominance of ant was expected because this group is more abundant and extremely adaptable to the most diverse ecological niches in the neotropical region. The genus that presented the largest number of individuals collected was *Azteca* with 60% of individuals in a single trap. This fact suggests that there may be a change in tingling. Other studies indicate that the occurrence of the subfamily Dolichoderinae is reduced in the cerrado, being a smaller number of individuals in this biome.

3.1.3 INVESTIGATION IN ETHNOMYRMECOLOGY: CONCEPTION OF FARMER STUDENTS ABOUT ANTS

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Ants are important organisms for the environment and their disappearance could cause degradation of the ecosystem. Considering the services that these animals provide, understanding their biological/ecological aspects is of the utmost importance. In science/biology teaching, in primary education, is where the first concepts about ants are presented. However, teachers present only scientific concepts and ignore the students' prior knowledge or prevailing traditional cultures (*e.g.* indigenous, quilombola or agricultural), which could add to the class. In this perspective, the relationship between culture and science is relevant for the understanding of concepts. In this context, ethnomymecology could be a useful tool to get students to engage in a cultural dialogue with science, thus making the understanding of scientific concepts about ants more attractive. However, although important, very few studies have evaluated conceptions of different cultural groups regarding ants. Based on this, the present work presents an analysis of the perception of high school agricultural students of a public school located in a rural community in the inner city of Lagarto in the state of Sergipe, Brazil. The research was carried out with 27 students (24 boys and three girls), from the 3rd year of high school, all of them are children of farmers and also perform some type of agricultural activity, through semi-structured questionnaires, informal interviews and visits to zoology classes and the school places where these students developed these activities. The questions that guided our research were: (i) do students have any previous knowledge about ants? (ii) The conception of these students helps them to understand scientific concepts? As results, we obtained what was already expected, all the students showed to have some previous traditional knowledge about the ants, mainly on the morphology and ecology, also showed to understand the eusocial structure of these organisms. When questioned about the origin of this knowledge, the vast majority said of the parents and "working in the field". However, everyone believed that the ants were only agricultural pests that "eat the crops". The previous knowledge of these students about the ants showed to facilitate the understanding of concepts applied in the classes of zoology on ants. Our results reveal the importance of popular knowledge for the understanding of science, especially for myrmecology, so it is important to carry out studies in the field of ethnomymecology.

3.1.4 LEAF-CUTTING ANTS PREFERENCE TO SUB PRODUCTS USED IN BAITS

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Leaf-cutting ants are eusocial insects and known to cultivate a mutualistic fungus that is a primer font of food for the colony. Thereat, they use plant materials as a substrate for the fungus garden. Only one colony can contain millions of individuals with intense cutting activity, so it can cause great harm to agriculture and for that, they are considered pests. The most used method for the control of these ants is the chemical, with toxic bait associated with an attractive vegetal origin compound, being the citric pulp the most used. Colony workers, after prior contact with the bait, associate their toxicity with the attractive compound and reject it, rendering the method inefficient. Thus, the present research had as objective to evaluate the preference of the species *Atta sexdens* and *Atta laevigata* to different attractive compounds used in the composition of granulated baits. For the tests, insecticide-free baits were formulated with the following industrial sub products: citric pulp as positive control; cashew; citric pulp (50%) + cashew (50%); cashew (2%) + citric pulp (98%); mango (50%) + citric pulp (50%); soybean and citric pulp (50%) + soybean (50%). The tests were carried out in the laboratory and in the field. In the laboratory, 16 colonies were used for each species, and three treatments were offered at a time (0.5g) at random positions until the same treatment had been arranged in the three positions of the test arena. The assay was ended when one of the treatments had been fully loaded and then the unloaded granules from the other treatments were weighed. Using the same method in the field, the baits were offered in a glass plate next to the foraging trail of five active nests of each ant species. The outcomes obtained in the laboratory and in the field were similar, being the soybean and soybean 50% treatments the most loaded. The order of preference for *Atta sexdens* was: citric pulp; soybean and soybean (50%) + citric pulp (50%). And for *Atta laevigata*: citric pulp; soybean (50%) + citrus pulp (50%); cashew (50%) + citrus pulp (50%) and soybean. The results obtained for the two species showed that the soybean and cashew sub products were the most attractive. The study of attractive compounds to be used in granulated toxic baits enables their rotation when applying the chemical control for leaf-cutting ants. (FUNDUNESP)

3.1.5 MASS FORAGED BY *ATTA SEXDENS* (HYMENOPTERA: FORMICIDAE) IN BRAZILIAN BIOMES

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Eucalyptus plantations are widely distributed in Brazil, occupying areas in almost all the biomes of this country. The same is true to leaf-cutting ants, which are important pests in many crops in almost all biomes. Brazilian biomes present climatic differences and the ants are strongly affected by climatic conditions, such as temperature and humidity. Therefore, they are expected to carry different amounts of leaf mass in each biome. The objective of this work was to evaluate the mass foraged by the leaf-cutting ant *Atta sexdens* Forel (Hymenoptera: Formicidae) in the Atlantic Forest, Cerrado and Pampa biomes and in the region of transition Atlantic Forest-Cerrado. Five nests of *A. sexdens* were selected each biome and the total dry mass forage per square meter per day (mg.m².day⁻¹) was measured and submitted to the adjustment of generalized linear models (GLM) by biome, using R program. The foraged dry mass per square meter of nest per day differed between the biomes, with higher values in the region of transition Atlantic Forest-Cerrado and lower in the Atlantic Forest. It is believed that the environmental conditions in the Atlantic Forest-Cerrado transition are more suitable for ants. The quantification of herbivory activity of the ants in the Brazilian biomes assists in the prediction of losses in the eucalyptus production in each biome. (CNPq, Fapemig, Cenibra, CAPES)

3.1.6 THERMAL TOLERANCE OF *ATTA BISPHAERICA* (HYMENOPTERA: FORMICIDAE) IN LABORATORY CONDITIONS

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Several environmental factors influence the physiology and behaviour of insects. Temperature is one of those factors that directly affect the performance of ectothermic insect activities, such as leaf-cutting ants. Knowing the thermal tolerance of these insects makes possible to understand how their activities can be affected by changes in temperature. The objective of the study was to evaluate the thermal tolerance of the leaf-cutting ant *Atta bisphaerica* in the laboratory. Ants were individualized in Petri dishes, containing filter paper moistened with 20 µl of water. The dishes were placed into a climatic chamber BOD, with temperatures of 0, 10, 20, 30 or 40°C ± 2°C. The immobilization time of 30 ants was evaluated each temperature. The immobilized ants were removed from the chamber and maintained at 25 ± 2°C to evaluate the recovery time. Subsequently, the final mass of each individual was measured. The influence of temperature and mass of the ants (mg) on the immobilization time and recovery time was analysed by the Weibull survival model, using R. The temperature variation influenced the immobilization and recovery time of the ants. The ants were immobilized faster at 0°C. Ants immobilized at 40°C did not recovery their movements, indicating that this temperature is critical for these insects. The ant immobilization time was significantly and positively influenced by the mass. The ant mass did not influence the recovery time. This study allowed to estimate the thermal limits of *A. bisphaerica*, which could be used to understand the influence of temperature changes on the foraging patterns of these insects. (CNPq, FAPEMIG, CAPES)

3.1.7 DO PITFALL TRAPS FOR DUNG BEETLES EFFICIENTLY SAMPLE ANTS?

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Ants and dung beetles are two extremely abundant groups of invertebrates, sensitive to changes in the environment and important for several ecosystem services. Both are employed in monitoring biodiversity and are good environmental indicators. Methods of catching ants vary widely, but pitfall traps are good for both groups and capture a significant portion of biodiversity. Thus, those who do work with the capture of dung beetles may also collect material for myrmecological studies. However, the pitfall traps for beetles should contain baits (faeces) as an attractant. The baits are not used in monitoring protocols for ants to collect this group, but if there is an intention to minimize collection effort, costs and facilitate logistics, it is necessary to determine if there is an effect of the baits on the biodiversity of ants collected in the same traps. Therefore, the objective of this work is to discover if pitfalls baited with human faeces do not disturb the natural capture of ants. 42 sampling points with pitfall traps were distributed in soybean production systems in the state of Mato Grosso, Brazil. Each site received 12 traps (six within the native habitat and six within the soybean crop), of which three were baited in each habitat. In total, 157 species were collected, of which 118 were recorded in pitfalls with bait (108 in native habitat and 33 in soybean cultivation) and 137 in pitfalls without bait (128 in native and 41 in culture). Our results show that the average richness collected in pitfalls with bait included 75% of species, whereas the pitfalls without bait showed an average richness of 87%. The vast majority of species were collected by both methods. However, 60 species were collected exclusively in pitfalls without bait and only 16 in pitfalls with bait. We conclude that the use of bait has a negative effect on detected richness, but this effect is not strong enough to modify species composition patterns. However, depending on the type of study, a small decrease in richness can have an effect and can influence the results. Thus, we suggest that baited pitfalls can be used in a complementary way to conventional pitfalls, but never replace them, particularly in studies with a more zoological than ecological approach. (FAPEMAT, CAPES)

3.1.8 DRAWINGS AS A TOOL FOR RECOGNITION OF CHILDREN PERCEPTIONS ABOUT ANTS

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There are several ways to research popular knowledge, one is through non-verbal language, where drawing is used as a playful tool. Thus, our goal was to investigate the perception of children through drawings about how they imagine the ants and what these organisms do. We hypothesized that: i) children would not represent all the morphological structures that characterize ants; ii) the functions represented would be associated with urban environments; iii) the representations of the ants would be larger than when they were represented performing some function. We used drawings from sixteen children between 9 and 13 years old. We requested them to draw according the following questions: "How do you imagine the ants?"; "What do you imagine the ants do?". To analyze the morphological data, we created seven categories (geniculate antennae, eyes, number of body segments, petiole, mandibles, quantity, and position of legs) and we punctuated its presence or absence. For the functions, we identified whether they were related to natural or urban environments. Regarding the size of ants, we categorized them into small (up to 5 cm), medium (5 to 10 cm) or large (greater than 10 cm). It was possible identify representations of ants, but we didn't observe any drawing with all the ants morphological characteristics that we created. Also, there were representations with increase in the number of segments and pairs of legs, as well as humanized expressions. Ninety-four percent of the drawings presented some functions, 90% of which in the natural environment (cutting and loading leafs). The allusion to leaf-cutting ants, which are considered soil-engineers and abundant in tropical regions, may occur because they are commonly seen while performing this function. Only two designs presented the function associated with urban environments (ant consuming sweet things, and biting a person's foot). In 66% of the drawings, the body size was smaller when represented while performing functions. This difference emphasizes that ants are drawn in larger dimensions to point to structures that may not be so noticeable in real size. The size reduction in the function's representations may come from the process of human observation because the insects are markedly smaller in comparison to us. Studies like this are important to recognize perceptions and to promote the exchange of knowledge, proving to be an important tool to work the morphology and importance of the ants for the functioning of the ecosystems, in a playful and participative way. (CAPES, FAPEMIG, CNPq)

3.1.9 ANTS (HYMENOPTERA: FORMICIDAE) IN CONILON COFFEE CROPS

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The genus *Coffea* is formed by perennial plants of Rubiaceae family. *Coffea canephora*, known as Conilon Coffee, is one of the most worldwide produced. In Brazil, the Conilon coffee is largely cultivated with other crops, mainly with *teca* (*Tecnocla grandis*). This practice produces a shading that favors the creation of a favorable microclimate to many invertebrate groups, specially arthropods. In this study we analyzed the communities of predator ants in coffee crops with *teca* and in monoculture. Our hypothesis is that coffee crops with *teca* are richer in predator ants than monoculture. The studying areas (n=4) are located at Sooretama municipality, Espírito Santo State (Brazil). Twenty-four pitfalls traps were installed in each area and kept in the field for 48 hours. Only the predator ants were identified and analyzed about their diversity and equitability. The crops were compared about their predator ant species diversity. We found 25 predator ant species. The coffee crop with *teca* were richer and more diverse, with 21 species. The most frequent specie was *Odontomachus chelifer*. Our results suggest that the cultivate with only coffee plants reduce the diversity of predator ants, besides to favor more generalist species, as *Solenopsis*. In this case, the farmers should be more encouraged to plant coffee with *teca*, because this practice favors predator ants, that are fundamental at nature control of pests. (CNPQ, ICAPER)

3.1.10 FAMILY VEGETABLE GARDENS: A GUIDE TO CONSERVATION OF THE HORTICULTURAL CULTURE AND THE ECOLOGICAL MANAGEMENT OF PESTS

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Family vegetable gardens are part of the culture of countryside communities, however, this practice has been lost over the last decades. Beyond cultural issues, families have many problems with several invertebrates with potential to become pests which attacks the plants cultivated in the vegetable gardens. In this context, we elaborate a booklet with the aim to present the importance of the family vegetable garden practice, as well as, the main pests which could attack the cultivated plants in these systems and the alternative methods for their control. The booklet construction was based on a previous study with five countryside communities including 46 people from Santa Rita de Caldas, south of Minas Gerais, Brazil. In this study the ants were pointed by the farmers as the main pest in the vegetable garden (86% of the citations), therefore we gave special attention to them. The booklet is constituted by three main parts: i) the vegetable garden and its benefits for families; ii) the main pest which occurs in the vegetable gardens represented by aphids, slugs and snails, caterpillars, crickets and grasshoppers; and iii) "The ants: a special case". In the last part of the booklet, we presented the ants, explaining that only a few species are potential pests. Beyond that, we explained how to identify the two genera of leaf cutter-ants *Atta* and *Acromyrmex* that are potential pests, their biology and the possibilities for their control. Lastly, we present the ants as allies in the horticultural practices by ecological functions played by them, as biological control agents, improving the physical and chemical structures of the soil and protecting the plant from the herbivory. This booklet is under editorial process for publication and was prepared with accessible language especially for the countryside communities, aiming to encourage the maintenance horticultural culture, as well as, to disseminate the basic knowledge about ant ecology and their importance for the productivity and maintenance of the horticultural systems. (CNPq, CAPES, FAPEMIG)

**3.1.11 PARASITIC AND ENTOMOPATHOGENIC FUNGAL
BAITS HAVE POTENTIAL FOR CONTROLLING
LEAF-CUTTING ANTS: DELETERIOUS EFFECTS ON
THE SYMBIOTIC FUNGUS *Leucoagaricus gongylophorus***

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Leaf-cutting ants are considered one of the most important agricultural pests in Brazil. *Acromyrmex subterraneus subterraneus* workers carry vegetal fragments to their underground nests, where their mutualistic fungus, *Leucoagaricus gongylophorus*, is cultivated. Such behavior results in huge losses in agriculture, forestry and grassland areas of South America, Central America, and Southern North America. The most common method to control this pest is the use of chemical insecticides. However, work is necessary in order to find and develop more efficient and less toxic control methods, such as the use of biological control. Therefore, the aim of this work was to produce a granular attractive bait incorporating the mycoparasitic fungus *Escovopsis* sp. and the entomopathogenic fungus *Beauveria bassiana* as active ingredients for the control of the leaf-cutting ant *A. subterraneus subterraneus*. The baits were made with orange flour, vegetable oil, carboxymethylcellulose and fungi suspensions. *Beauveria bassiana* strain LPP139 and *Escovopsis* sp. strain S2 were used in these bioassays. Four treatments with three repetitions each were established: *Escovopsis* 1×10^8 conidia mL^{-1} , *Escovopsis* + *B. bassiana* 1×10^8 conidia mL^{-1} and *B. bassiana* 1×10^8 conidia mL^{-1} . Control treatment consisted of baits without fungi. Five grams of bait was offered to each *A. subterraneus subterraneus* mini-colony. The height and weight of the symbiotic fungi was assessed for 21 days. The results demonstrated that in all fungal treatments, the height of fungus garden was reduced, in comparison to the control treatments. The fungus garden height decreased 42.2% in the *Escovopsis* treatment, 26% in the *B. bassiana* treatment, 25.7% with a combination of *B. bassiana* + *Escovopsis*. A similar negative effect was observed for the weight of the fungus garden. The results showed a progressive decrease in the weight of the mini-colony gardens. The weight reduction was 31.6% for the *Escovopsis* treatment, 18.7% for *B. bassiana* + *Escovopsis* and 13% for *B. bassiana*. The use of baits with biological control agents is promising for the management of leaf-cutting ants, since the combined effects of the parasitic fungi *Escovopsis* sp. and the entomopathogen *B. bassiana* is a threat to the colony, as demonstrated in this study. (UENF, FAPERJ)

3.1.12 DO YOU EAT ANTS? A CASE STUDY OF ENTOMOPHAGY IN SERRA DA IBIAPABA, CEARÁ, BRAZIL

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Because of their diversity and abundance, insects are frequently in contact with people, bringing experiences that can affect the judgment, perception, and attitude towards these animals. Insects have utility in several areas, among its uses, we can mention entomophagy, which is the use of insects as a food resource. Numerous peoples contributed to the formation of Brazil, and although several of these peoples have insects in their diets, entomophagy is uncommon in the country and studies in this area are even scarcer, contributing to the lack of information and acceptance of such practice. The Ibiapaba mountain range, located in the state of Ceará in northeast Brazil, was once inhabited by several indigenous ethnic groups and is still influenced by the customs and habits of these peoples. The present work seeks to understand the preservation of the entomophagy of queens of leaf-cutting ants (popularly known as tanajuras) at Ibiapaba cities, in addition to relating this practice with the perception of the entomofauna by the inhabitants of the region. Data collection was performed with interviews with local residents using the Free Association of Words test (TALP) and a semi-structured interview and analysis of collected data was performed using the Iramuteq tool. In total, we interviewed 51 inhabitants of the Ibiapada mountain range from nine cities. Our data show that 47% of participants did consume tanajura. Moreover, entomophagy in the Ibiapaba mountain range is associated to cultural factors, since the population does not recognize benefits derived from this consumption, and that the tanajuras are insects "apart" producing different perceptions of the presented repulsion to other insects. Furthermore, the activity of collecting tanajura is achieved with friends and family and is considered as recreational and social activities. Some residents may collect ants for store and have all year long as appetizer and others use as a complementary income selling at street markets for relatively high cost. The participants that did not consume tanajuras argue that entomophagy is repulsive and has no health benefits. For entomophagy to be accepted, it is necessary to demystify the beliefs that insects are disgusting animals and the food source of marginalized groups. We hope that this study may provide information that promotes reflections, contributing to the reduction of negative perceptions about entomophagy and insects.

3.1.13 NATURAL OCCURRENCE OF ENTOMOPATHOGENS INFECTING *Atta sexdens* QUEENS

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Leaf-cutting ants are important pests in a variety of neotropical agrosystems due to their habit of cutting and transporting plant material to the nest for the cultivation of their symbiotic fungi. The interest in biological control agents, such as entomopathogenic fungi as an alternative to chemical insecticides, has grown worldwide because of their environmentally secure characteristics. Two of the most used fungi in biological control of pests are *Metarhizium anisopliae* and *Beauveria bassiana*, efficient pathogens of a wide range of insect pest species. Here, we report the natural occurrence of entomopathogenic fungi in leaf-cutting ant *Atta sexdens* queens. We also assessed the virulence of these isolates. Sixty-nine *A. sexdens* queens were captured immediately after the nuptial flight, whilst they were digging holes in the ground to form new colonies. The queens were maintained in the Myrmecology Unit in plastic containers with 250g of soil from the capture location. During the following days, two of the queens died and fungal conidiogenesis was observed on the cuticle. Using sterile tweezers, conidia from these queens were inoculated onto PDA media supplemented with chloramphenicol and incubated in BOD chamber at 27 ± 1 °C and 70% RH for 10 days. The fungi were identified as *Metarhizium* sp. using standard techniques and stored at 4°C. Bioassays were then carried out with these two isolates (1 and 2). Ten μL of a suspension with 1×10^6 conidia mL^{-1} of both isolates were inoculated in PDA media on Petri dishes to evaluate fungal growth and conidia production. Bioassay of both isolates at concentration of 1×10^7 conidia mL^{-1} were carried out by exposing *Atta sexdens* workers to fungus impregnated on filter paper in Petri dishes. Workers were maintained in the Petri dishes for 24 hours. Mortality was assessed daily for seven days. The average rate of mycelial growth of the two isolates on PDA media was 5.8 cm (isolate 1) and 5.3 cm (isolate 2). Spore production of both isolates on PDA media was 4×10^8 spores mL^{-1} . There were no significant differences in virulence for both isolates. On the 7th day of the experiment, 100% mortality was seen for workers treated with isolate 1, whilst 10% of workers treated with isolate 2 were still alive at this time. Natural occurrence of entomopathogens infecting leaf-cutting ant queens, the exclusive reproductive individuals of the colony, indicates that biological control could be employed against these insects (UENF, CAPES, FAPERJ)

3.1.14 INFLUENCE OF MICROBIOLOGICAL CONTROLLING AGENTS ON THE FORAGING ACTIVITIES OF *Acromyrmex subterraneus subterraneus* MINI-COLONIES

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Leaf-cutting ants are social insects with a very well defined division of labor among the different casts. This results in efficient and complex cooperation and organization that promotes success and stability of the colony. Foraging activities are essential to maintain this balance, as workers bring fresh leaves into the nest in order to cultivate their symbiotic fungus, *Leucoagaricus gongylophorus*. Because of their intense foraging activity, they are a major problem in agriculture. The most common method for controlling leaf-cutting ants is the use of chemical baits, which is efficient and relatively simple but causes environmental problems. Our work aimed to evaluate rate at which leaf-cutting ants foraged *Acalypha wilkesiana*, a well accepted vegetal resource, after offering the ants a bait containing the entomopathogen, *Beauveria bassiana*, and the mycopathogen, *Escovopsis* sp. fungi species. The experiments were carried out using *Acromyrmex subterraneus subterraneus* queen-less mini-colonies under laboratory conditions. The baits were made with orange pulp powder as a base, and the fungi suspension was added to it. Four treatments with three repetitions each were established: *Escovopsis* 1×10^8 conidia mL^{-1} (ESC), *Escovopsis* + *B. bassiana* 1×10^8 conidia mL^{-1} (BB+ESC) and *B. bassiana* 1×10^8 conidia mL^{-1} (BB). Control treatment consisted of baits without fungi. Five grams of bait was offered to each mini-colony. The evaluations showed that 19% of the baits were carried to the nest in the ESC treatment, 35% in BB+ESC treatment and 35% in the BB treatment. All of the control baits (100%) were carried to the nest. After the bait was offered, the foraging activity decreased by 67% in ESC, 65% in ESC+BB and 63% in BB, while in control treatment foraging decreased by only 28%. The results show that the workers could identify the pathogens, and all fungal treatments had reduced rates of bait foraging. After contact with the baits, the harvesting rate of ants on *Acalypha wilkesiana* leaves decreased consistently in all fungi treatments. We may consider that besides the negative impacts of the pathogens to the colony itself, the presence of the baits in the nest could also reduce foraging activities, which would be advantageous for the protection of agricultural systems. (UENF, FAPERJ)

3.1.15 CUTTING PREFERENCE OF *ATTA SEXDENS* (LINNAEUS, 1758) BY SPECIES INDICATED FOR ECOLOGICAL RESTORATION

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The degradation of the Brazilian phytogeographic domains has threatened biodiversity conservation and the generation of ecosystems services. One way to minimize this process is planting restoration forest species. However, the monitoring is necessary due to the emergence of leaf-cutting ants, whose attack can decimate planted seedlings or compromise the natural regeneration in older plantations. Therefore, we evaluated the cutting preference of *Atta sexdens* ants to ecological restoration species into laboratory conditions. We selected 12 plant species that are considered as cover tree species (fast growth and dense and ample crown, which benefit shading), whose apical segments (stem, leaves or leaflets) were collected in restoration areas at CCA/UFSCar, Araras, SP (22°18' 28 S; 47°23' 18 W). We offered, simultaneously and equidistantly, 10 units (discs, Ø = 0.5 cm) of leaves of the plants in a foraging arena (plastic tray), interconnected to the colony of *A. sexdens* (about 2 years-old). At the end of each experiment, we evaluated the number of transported discs into the fungus chamber. The experiment consisted of 12 treatments (botanical species) offered to five colonies (repetitions), with two presentations per colony. The data were compared by ANOVA followed by Duncan's test. There was a significant difference between both treatments, and the species *Anadenanthera colubrina* (Fabaceae) and *Solanum granulosoleprosum* (Solanaceae) were less transported. We will perform additional field and laboratory tests, but these preliminary results can assist as a complementary criterion for species selection for ecological restoration.

3.1.16 DOMINANCE OF ANTS IN RIPARIAN FORESTS IN THE DOCE RIVER/MG BASIN AFTER THE DISRUPTION OF THE SAMARCO DAM

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Despite being protected by laws, riparian areas suffer evident degradation due to occupation and improper use of the soil. In the Doce River basin, particularly after the technological disaster resulting from the disruption of the Samarco's mining dam, several initiatives to recover the riparian environments have been implemented as a form of compensation. However, much of the biota of the basin is not known, as well as its relations. Therefore, the present work is part of a study that aims to understand dominance relationships in ant communities upstream and downstream of the point where the mining tailings plume reached the gutter of the Doce River and some of its unreached tributaries directly by disaster. We tested the hypothesis that there is a difference in the species composition of these segments of the hydrographic basin in question. To test this hypothesis we plotted transects ten meters from the riverside in thirty areas of the Doce River basin. In each transect we demarcate ten points distant 25 meters between each other and in each one of these points sardines and honey baits were placed for 50 minutes in the soil and in the trees. In the samples of 15 areas already processed (300 samples) were computed: 19 species in seven impacted areas by the mining tailing, 20 total species in the six riparian areas of tributaries where there was not deposition of tailing and 7 total species in the areas to upstream of the basin where there was not tailing. The analysis of species composition reveals significant differences between the affected and not affected areas by the reject. The most frequent species on the riversides of the impacted areas of the Doce River belong to the genera *Cephalotes* (one species), *Crematogaster* (one species), *Pheidole* (three species) and *Wasmannia* (one species), already in the areas associated with tributary we found *Brachymyrmex* (one species), *Camponotus* (one species), *Linepithema* (one species), and *Solenopsis* (one species) and in the upstream areas we found *Camponotus* (one species), *Crematogaster* (two species) and *Pheidole* (two species). Up to moment, our results suggest that the presence of the tailing in riparian forests modifies the dominance of ants in riparian forests. (CAPES, CNPQ, FAPEMIG, UFOP).

3.1.17 ANTAGONISM OF THYMOL AND CARVACROL AGAINST THE MUTUALISTIC FUNGUS OF LEAF-CUTTING ANTS

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Leaf-cutting ants obtain the basic nutrients for their survival from the mutualistic relationship they have with the fungus *Leucoagaricus gongylophorus* (Basidiomycota: Agaricales), providing for it fresh plant parts as a substrate for their growth. This relationship is essential for the survival of both partners and, therefore, any action on the fungus directly reflects on the ants. Leaf-cutting ants are important pests in agriculture and in cultivated forests and the search for new compounds that can be used in their control is necessary in a context in which damage to the environment and non-target organisms should be minimized. The use of secondary metabolites produced by plants appears as an alternative to the active ingredients used today. This study evaluated the effect of two metabolites produced by *Lippia triplinervis* (Lamiales: Verbenaceae) on the development of the fungus cultivated by leaf-cutting ants. The growth of the fungus isolated in culture medium was evaluated in the presence of each of the compounds in concentrations of 1mg/mL, 5mg/mL and 10mg/mL, diluted in acetone. Ten Petri dishes which received 100 µL of the solution on the oat-based culture medium were used for each concentration. In addition, ten other plates received 100 µL of acetone, functioning as a control. Then a circular portion of the fungus 0.5 cm in diameter was added. The growth diameters were measured horizontally and vertically during one month, every seven days. At the end of the procedure the growth area was calculated and the fungi were removed from the culture medium and dried in an oven for the quantification of dry mass. Thymol and carvacrol inhibited fungus growth at all concentrations tested. There was no difference in the area and mass of the fungus between the concentrations for carvacrol. Whereas, thymol presented lower inhibition at the lowest concentration, although it differed significantly from the control. Both compounds have shown to be antagonists to the fungus cultivated by the leaf-cutting ants and should be considered as possible control agents of these insects. (CNPq)

3.1.18 DIVERSITY OF ANTS (HYMENOPTERA: FORMICIDAE) AIMING AT MONITORING “RPPN BOTUJURU” IN THE MUNICIPALITY OF MOGI DAS CRUZES, SP, BRAZIL

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The Brazilian Atlantic Forest, although reduced and fragmented, with only 12.4% of its area with native vegetation, presents great biodiversity. Seeking to preserve and maintain the biodiversity of this biome, Conservation Units, governed by the National System of Nature Conservation Units (“SNUC”), are created and maintained in many states of the country. This practice seeks the restoration of fragmented environments and their protection. Among the categories of Conservation Units, we highlight the Private Reserve of Natural Patrimony (“RPPN”). In the municipality of Mogi das Cruzes (SP), “RPPN Botujuru” was recently created aiming at potentializing efforts for the conservation of one of the most important forest remnants of the Atlantic Forest in São Paulo State: Serra do Itapeti. Knowing that ants are efficient in the monitoring of areas under restoration, we evaluated the composition of ant communities in abandoned areas of *Eucalyptus* sp. comprising an understory with native Atlantic Forest species. We expect the results to represent the ground zero for analysis of the regeneration process in the area. We demarcated eight plots of one m² of litter distributed in two transects of 200 m each. Mini-Winkler extractors were used for sampling leaf litter ants. In total, we evaluated 16 m² of leaf litter. Our taxonomic list has 2,518 ants belonging to 9 subfamilies, 24 genera, and 60 species. The most frequent genus (*Solenopsis*) and species (*Pheidole sospes* and *Wasmannia affinis*) belong to generalist ants. Notwithstanding, some specialist species have been recorded, such as *Strumigenys* spp. and *Discothyrea sexarticulata*. Our results show that the ant species registered in the “RPPN Botujuru” reflect the impact of eucalyptus plantation even with the presence of an understory. (CNPQ, Ecofuturo Institute)

3.1.19 EXTRACTION METHODS OF ANT GLAND SECRETIONS: A REVIEW

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Ants possess a remarkably sophisticated immune system with 84 different exocrine glands. Most of the glands are used in defense against pathogens, which makes the ant a suitable group to carry out bioprospecting research. The most well-known glands in the scientific literature are metapleural, mandibular glands, poison gland and Dufour. The metapleural gland is exclusive to ants and consists in structures located in the post lateral region of the thorax. It is known mainly for the antibiotics production capable of inhibiting fungi and bacteria that develop inside the colonies. The Dufour and venom glands are abdominal and occur in association with the reproductive system. The Dufour gland produces trail pheromones related to recruitment and mating. The venom gland produces alarm pheromones, trail and acts on the capture and defense of prey as an integral part in the topical application of venom. The mandibular gland occurs in the anterior region of the head near the basal margin of the eyes. It is responsible for secreting compounds that are part of an alarm and recruitment system, sex pheromones and antibiotic substances. Identifying and analyzing extracting methods of ants glandular secretions can contribute to the improvement of these methodologies and the development of new researches. In this context, this research aims to describe the development concerning the extracting methods of ants glandular secretion. The search for articles was carried out in the Capes journals portal, in the Virtual Health Library and SCIELO between 1989 and 2017. In all, 52 articles were selected and analyzed. The data were scanned for frequency and results presented through graphs and tables constructed in Excel for Windows. The extraction methods most reported in the articles were maceration of the gland and extraction with solvents such as acetone, chloroform, dichloromethane, hexane, methanol, pentane, ethanol, direct extraction of the gland and maceration of the gland in water. The most frequently reported glands in the articles involving extraction of ants secretions were Dufour (21.15%), metapleural (15.38%) and mandibular (11.53%). Many studies have reported the use of a combination of glands, ant parts or the entire ant in studies. The genera *Crematogaster*, *Atta*, *Acromyrmex* and *Solenopsis* were cited in the largest number of studies. There is a lack in the literature about the standardization and evaluation of the methods used for the extraction of glandular secretions from ants, as well as for most taxa. (PPGSC, UNOCHAPECÓ).

3.1.20 CHEMICAL CHARACTERIZATION OF METAPLEURAL GLAND SECRETIONS AND APPLICATION: A REVIEW

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Ants are social insects that live in colonies characterized by a dense aggregation of related individuals. Its activities are regulated by climatic factors such as temperature and humidity. These factors, within the colony, are ideal microenvironments for the symbiotic microorganisms development or that expose the colony to potentially lethal diseases. As an adaptation and strategy of survival, the ants present mechanisms to defend their colonies through behaviors, antibiotic production and immune defences. Ants are known among insects because they have the largest number of exocrine glands with 84 different glands, most of which are used in defense against pathogens. In this impressive exocrine system, the metapleural gland, exclusive to ants, is of special importance. Consisting of paired structures located in the post lateral region of the thorax, it is known by the antibiotic production capable of inhibiting fungi and bacteria that develop inside the colonies. However, most of the studies performed with metapleural glands, aim to study the evolutionary origin and morphology. It's remaining a gap in the scientific literature to identify the chemical composition of the substance secreted by the metapleural glands and possibilities of uses as antimicrobial properties. In this context, the research aimed to describe the knowledge development regarding the chemical characterization and application of the metapleural gland secretions. It is a review of the scientific literature between 1989 and 2017. The search for the articles was carried out in the portal of journals of Capes, in the Virtual Health Library and SCIELO. In all, 52 articles were selected. Data was scanned for frequency in Excel for Windows. In the metapleural gland secretion were isolated more than 20 compounds, most of the substances are short chain acids such as acetic, hexanoic and heptanoic acids. Long-chain, tetradecanoic, pentadecanoic and palmitic acid. Also keto acids such as 4-oxooctanoic and 4-oxodecanoic acid, plus a fraction of proteinaceous compounds. Of the analyzed articles, six (11.54%), carried out the application of the secretions aiming the microorganism control. Genera *Crematogaster*, *Atta*, *Acromyrmex* and *Solenopsis* were cited in the largest number of studies related to the identification and application of secretions. It is noticed that only a few species of ants have been studied in detail to identify active chemical compounds and their function. There is a lack in the literature about the chemical characterization and application of the secretions of the ants metapleural gland, as well as for most of the taxa. (PPGSC, UNOCHAPECÓ).

3.1.21 DETERRENT EFFECT ON FORAGING BY NEST REFUSE OF LEAF-CUTTING ANTS

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The nest refuse produced by leaf-cutting ants is composed by dead parts of their symbiont fungus, debris of plant material and corpses of ants, and may harbor substances and microorganisms harmful to the ants and their symbiont fungus, with a high risk of mortality of workers in direct contact with the refuse. Thus, ants avoid contact with this residue to try to reduce the risk of contamination in the colonies. In this way, studies suggest that the disposal substrate can be used to prevent the attack of leaf-cutting ants on plants. We analyzed experimentally if this deterrent effect of the nest refuse is also effective as liquid extract. For this, 30 colonies of *Acromyrmex balzani* and 36 colonies of *Atta opaciceps* in the field were selected and 30 baits made with straws and citrus pulp were offered to each colony, being three treatments with 10 baits for each. The treatments were: baits elaborated with plastic straws (0.5 cm) with citrus pulp and 20% (w / v) refuse extract of *A. balzani* (ExtAc) or *A. opaciceps* (ExtAt) and control baits (50% water / alcohol with citrus pulp). The baits were available to the colonies of *A. balzani* for 30 minutes and to the colonies of *A. opaciceps* for 20 minutes, counting the time and the amount of baits removed, compared through survival analysis and LME. The results indicated that there was a deterrent effect on the foraging activity of the ants, with the ExtAt treatment being more efficient. However, the extract with nest refuse (either ExtAc or ExtAt) had a significantly higher deterrent effect than the control extract. These results bring new perspectives to the research of sustainable forms of pest management, and new studies are necessary to verify if the extracts sprayed on leaves of different cultures have the same effect as that observed in the baits and the duration of that effect in field conditions. (UFS, CNPq, CAPES)

**3.1.22 DETERRENT EFFECT OF NEST REFUSE OF
LEAF-CUTTING ANTS AGAINST THE APHID *Lipaphis
erysimi* (L) Kaltenbach, 1843**

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Sustainable management methods for agricultural pests are constantly being sought. The nest refuse produced by leafcutting ants is reported as deterrent to their foraging. This substrate is avoided by the ants because it represents a harmful substrate. Therefore, we analyzed experimentally if a liquid formulation prepared with the nest refuse produced by leaf cutting ants of the species *Acromyrmex balzani* and *Atta opaciceps* and sprayed on plant discs would repel the feeding of the aphid *Lipaphis erysimi*. To do this, we performed 103 bioassays in Petri dishes (150mm diameter), with a disc of leaf of cabbage (*Brassica oleracea* L. var. Acephala) sprinkled with 50% control solution (water / alcohol) and another sprinkled leaf disc with the extract of *A. balzani* refuse (20%) (n = 49) or the extract of *A. opaciceps* refuse (20%) (n = 54). Leaf discs were disposed in the sides and 10 aphids *Lipaphis erysimi* in the centre of the Petri dish. In total 1,030 aphids were tested. After 1h acclimation we start the observation of choice behavior of aphids. The bioassays were compared through binomial analysis. There was a deterrent effect of the aphids for refuse extract of both ant species. These data are promising and the next steps are to identify the substances that are potentially causing the effect, the duration of the effect, as well as to test the repellent effect in other crops and against other pest species. (UFS, CNPq, CAPES)

3.1.23 BIOINDICATORS SPECIES FOR OMBROPHILOUS DENSE MOUNTAIN FOREST FROM A GRADIENT OF ANTHROPIZATION IN THE SERRA DO ITAJAÍ NATIONAL PARK, SANTA CATARINA, BRAZIL

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The forest fragmentation and the consequent loss of habitats were identified as the main cause of biodiversity loss. These modifications conduct to species extinction and displacement and affect the ecological interactions between the organisms. Ants are widely used in the evaluation of these effects, due to high abundance and richness and the high number of ecological functions that they make in the ecosystems. The southern Atlantic Forest is a region with great disturbance index, but, in the Mountain formation (altitude above 500 meters), large fragments still can be found, such as Serra do Itajaí National Park. However, there are no registers of bioindicators species in this environment. Thus, this work evaluated the ant assemblage in areas under different levels of disturbance in the Serra do Itajaí National Park, in order to determinate potential bioindicator species for the formation of the Ombrophilous Dense Mountain forest in the state of Santa Catarina. In two years, 13 collects were carried out in areas of native forest, natural regeneration at early successional stage and pasture under regeneration by nucleation techniques. The altitude in the Native forest area is 765 meters and in disturbed areas ranged from 637 to 661 meters. In each sampling, a transect with five pitfalls, without attractive, was randomizing installed and two 0,5m² litter samples took and deposited in Berlese-Tüllgren funnels for 14 days. For the determination of bioindicators species we used the Indicator Value (IndVal), which generates values in percentage referring the degree of fidelity and specificity of the species to a given environment. The 21,634 ants collected was divided into eight subfamilies, 31 genera and 147 species. In total, 24 species showed significant indication values: Native forest presented 15 species, including generalist species of *Pheidole* genera (specially *P. sarcina*) and *Oxyopocus reticulatus*, besides many predatory species, as generalists (e. g. *Hypoponera* spp. and *Hylomyrma reitterii*) as specialists (e. g. *Octostruma stenognatha* and *Discothyrea neotropica*). For the natural regeneration area, *Camponotus rufipes* (omnivorous) was significant. In pasture under restoration, four species have significant relationship with leaf litter transposition area (including the omnivorous *Camponotus melanoticus* and the leaf-cutting ant *Acromyrmex disciger*). The specialist predator *Strumigenys denticulata* have relationship with the seedlings planting modules area. Therefore, was possible to determinate, for the first time, potential bioindicators species for native forest, natural regeneration and disturbed area in the Atlantic Forest, phytophysiology Ombrophilous Dense Montana in the state of Santa Catarina (FURB, LAMPF, BNDES).

3.1.24 THE INTERPRETATION OF ANTS AMONG THE AMERINDIAN KARIPUNA FROM NORTHERN AMAPÁ, BRAZIL

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The Karipuna are an ethnic group of Amerindians dwelling in the northern Amapá, including the Uaçá indigenous territory and their native language is the French patoá. The traditional knowledge about the fauna of their forests, including the myrmecofauna, is passed from generation to generation. This study aimed to describe the ant knowledge of the Amerindian Karipuna highlighting their own point of view about these insects. The data were collected at the Manga Village using a semistructured questionnaire with 10 questions about the traditional Amerindian knowledge over the ants. Ten people were interviewed including seven elderly and three young Amerindians. In the patoá language, the word ant means *FÕMI*. The ants reported by the interviewed were: *FÕMI DJIFE* (*Solenopsis*), *FÕMI MÃIOK* (*Atta*), *FÕMI KHOBO* (*Cephalotes*), *THAKUA* (*Camponotus*), *TAK TAK* (*Odontomachus*), *FÕMI FU* (*Dolichoderus* aff. *bidens*), *FÕMI XASO HUI* and *FÕMI XASO NUE*. In a location near the carbê, the manioc farina production place, the Karipuna make use of *FÕMI FU* to control nests of *FÕMI DJIFE* by putting both nests together. The *FÕMI XASO HUI* and *FÕMI XASO NUE* ants are employed as seasonal markers. When the Amerindians find the *FÕMI XASO HUI* leaving their nests in the forest they understand it as a warning of the upcoming summer (dry season) while when they find the *FÕMI XASO NUE* leaving their nests they understand that the winter (rainy season) is coming. The *FÕMI MÃIOK* is considered a pest to the manioc crops and they usually apply tucupi in order to help controlling it. Furthermore, the presence of *FÕMI MÃIOK* in a land is an import criterion to exclude the possibility of starting manioc crops. The name *TAK TAK* given to *Odontomachus* ants by the Karipuna is actually an onomatopoeia since it has its origin in the sound of the fast shutting of their trap-jaw mandibles. The Karipuna also observed that *Camponotus* ants usually feed on the floral nectaries of a plant known by them as *THAKUA* and there is the origin of its name: *FÕMITHAKUA*. It is clear that ants play a wide and diversified role in the culture to the Amerindians from the Karipuna ethnicity, ranging from biological control to the forecasting the season of the year. Information about the ants *FÕMI XASO HUI* and *FÕMI XASO NUE* were collected but their taxonomic identification is a target for further investigations. (UNIFAP)

3.1.25 THE INFLUENCE OF ANTS BEHAVIOUR IN THE TURÉ RITUAL OF THE INDIGENOUS PEOPLES OF OIAPOQUE, ETHNIA KARIPUNA, IN THE NORTHERN OF BRAZIL.

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There are about 2,000 people composing the Karipuna, an ethnic group amazonian Amerindians living in 17 villages on the shores of the Curupi river in northern Brazil. These Amerindians speak both the Kheul and Portuguese and their most important cultural manifestation is the Turé ritual. It is a traditional event performed with shamanic entities (KARUÑAN) as retribution for the healing they provide through the shamans. This study aimed to describe the influence of ants behavior in the Turé ritual under the indigenous point of view. The information was obtained through interviews with elderly and young people from the Manga Village using a semi-structured questionnaire about the knowledge of Turé. The most important Turé ritual takes place in October during the second full moon. Many aspects are important for the Turé such as its typical drink CAXIXÍ (fermented manioc drink), the flutes (SINAL), long wood benches in snake format, representing the Big Snake and Alligator, and the masts. This ritual happens in a place called LAKUH where the shamans dance, sing and drink large quantities of CAXIXÍ. The dancing and singing occur without repetition so the entities listen the songs and lasts about one, two or three nights or until CAXIXÍ ends. The ritual stops early in the morning, returning late in the afternoon after the blow of a horn called CUTI. Near the dawn the FÕMI MÃIOK dance is performed where the participants are grouped in a line dancing in uniform fashion exiting in one of the LAKUH's door, returning to the LAKUH, walking around the place and exiting in another door of this place. They imitate a group of leaf-cutting ants. The participants, in line, can drink while they dance from a large canister filled with CAXIXÍ. These indigenous perform this dance at dawn as well as the foraging of leaf-cutting ants. This study shows the remarkable influence of the knowledge about the ants behaviour on the Turé ritual. Among mystical animals, the ants are the only insect represented in the ritual. The loss of the ethnomyrmechology knowledge was observed among young people and it is a serious concern for the elder Amerindians. Rescuing and documenting cultural aspects and traditions of the Karipuna is paramount in order to avoid the extinction of another Amerindian culture. This study rescued and reported the influence ant species on the culture of an Amerindian ethnicity revealed in a sacred ritual. (UNIFAP)

3.1.26 POTENTIAL OF INSECTICIDE PLANTS IN CONTROL OF LEAF-CUTTING ANTS: USE OF *CARAPA GUIANENSIS* (MELIACEAE)

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The main problem with the use of artificial insecticides in the control of agricultural pests is the numerous damages to the environment, the health of men and animals and the contamination of food by toxic waste. Leaf-cutting ants, especially of the *Atta* genus, are the main pests in the Brazilian agroforestry system. In the last decades, an effort has been employed in the search for new alternative methods for the control of leaf-cutting ants using botanical insecticides. The objective of this work was to elucidate plants with insecticidal potential and the main secondary metabolites to help in the alternative control of leaf-cutting ants and to do a field-test with a potential insecticidal plant. A literature review was carried out between 2000 and 2018 by the databases: Web of Science and Periódicos Capes using the keywords: leaf-cutting ants*plant extracts, leaf-cutting ants*bait plant extracts. The field experiment was carried out using *Atta sexdens* nests on forest area close to Tauari River, Marabá-PA, to test the repellent effect of *Carapa guianensis* (Meliaceae) oil, being a representative species in northern Brazil. Five fragments of 1 cm² of *Vigna unguiculata* leaves were dipped in 15% of essential oil mixed in distilled water and others 5 fragments in distilled water only. We analyzed the rate of fragment removal, the number of interactions, and the fragment discovery time by 30 minutes. We found a total of 137 papers addressing the use of extracts of plants with insecticidal potential. We recorded 68 species distributed in 29 families, Rutaceae (26%) being the most representative family (more species with insecticidal potential) followed by Lamiaceae (21%), Myrtaceae and Fabaceae (15%, each). These four families together corresponded to 77 % of plants with insecticidal potential compared to the others. The main secondary metabolites responsible for the insecticide action was terpenes (42%). We did not found repellence effect of essential oil's *C. guianensis*. Probably during the experiment the ants were cleaning the nest and not foraging or *C. guianensis* don't have repellence effect against *A. sexdens*. We conclude that Brazil has high distribution of insecticidal plants, specifically the species of the Rutaceae family. Plants with high concentrations of terpenes also have potential for the production of botanical insecticides, as *Zanthoxylum pohlium* and *Citrus limonia* (Rutaceae). Further field experiments are required to test the insecticide effect of other plants (ex: Rutaceae species) found in the present study. (UNIFESSPA, CNPq, CAPES)

**3.1.27 VARIATION IN THE DIASPORES REMOVAL BY ANTS
IN CERRADO: IS IT A REFLECTION OF
ANTHROPIZATION?**

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The removal of diaspores by ants plays a fundamental role in the environment due to their potential to reduce intraspecific competition between parent plants and diaspores. This ecological function affects the spatial distribution and establishment of seedlings, which may contribute to the revegetation of impacted areas. In this way, we tested the influence of anthropization on the removal of diaspores in different Cerrado areas (with native and modified vegetation) in the Pandeiros Environmental Protection Area region, Januária-MG. We selected 45 areas, 15 anthropized areas of which were near to the Pandeiros river's Small Hydropower Plant (SHP) and its marginal lagoon (with pastures and sediment banks at the beginning of ecological succession) and 30 of Cerrado stricto sensu: 15 with intermediate levels of anthropization (e.g. tourism activity), and 15 with preserved native vegetation. Diaspores removal in areas with intermediate and lower levels of anthropization was more similar to each other and presented higher values than the more anthropized areas (lagoon and reservoir). On the banks of the lagoon and reservoir, the areas are more anthropized (close to houses or the village of Pandeiros, with crops and animal husbandry) or are characterized as a bank of sandy sediments, probably with few ants, due to the difficulty to nest in the soil and constant flood impacts on the installed colonies. In addition to the intense anthropization, we can infer that the lower removal values recorded in the most anthropized areas are because these areas were not originally a typical Cerrado stricto sensu. Thus, given the increasing importance of the studies of diaspores removal by ants in degraded areas, our results help the planning of restoration strategies adapted to different contexts with spatial variations, vegetation types and anthropization levels. (CEMIG, CAPES)

3.1.28 BIOACUMULATION OF METALS IN *ATTA* SPP. AND *ODONTOMACHUS* SPP.

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Ants are organisms capable of storing metals in their bodies, in a cumulative and gradual manner, which are absorbed through direct contact with the soil of their nests and also through feeding. Different species have distinct bioaccumulation patterns of metals. In addition, certain ants can regulate the concentration of metals in your body. In this study, we evaluated the bioaccumulation of metals in *Atta laevigata*, *Atta sexdens*, *Odontomachus bauri* and *Odontomachus haematodus*. Worker ants of each species, as well as soil samples from their nests were collected in 2014 and 2015, in three locations from southeastern Bahia, Brazil: Itagibá (area attached to a nickel mining), Ibirataia and Jequié (control areas). The ants and soils of their nests were submitted to the FAAS (Flame Atomic Absorption Spectrometry) to obtain the concentration of the metals in the samples. Bioaccumulation factors (BAFs) were calculated for each metal detected, dividing the total metal content of the ant by the total metal content of its nest. The concentration of Fe (458,081 $\mu\text{g/g}$) and Zn (343,149 $\mu\text{g/g}$) was high at Itagibá to *Atta* spp., and the Cu (7,826 $\mu\text{g/g}$) also presented an important value. The Zn (680,534 $\mu\text{g/g}$) also had a very high concentration for *Odontomachus* spp. from the same locality, as well as to Ibirataia (608,658 $\mu\text{g/g}$); however the Cu (18,239 $\mu\text{g/g}$) presented a high value to Jequié. The obtained BAFs (more that 1; since BAF below 1 indicates no bioaccumulation) demonstrated the occurrence of bioaccumulation in the studied ants, whose important values to consider in a scale of 1 to 10 were: to *Atta* spp./Itagibá, Cu (4,482), Fe (4,375) and Zn (2,125), and Jequié, Cu (4,336); to *Odontomachus* spp./Itagibá, Zn (1,992), Ibirataia, Zn (2,151) and Jequié, Cu (2,235). These results demonstrate the occurrence of bioaccumulation of Cu, Fe and Zn in *Atta* spp. located in the region adjacent to the nickel miner, in addition to Cu in one of the control areas. It was verified that *Odontomachus* spp. accumulates less metals (Zn and Cu) than the leafcutting ants, both for Itagibá and for the control areas. This difference in bioaccumulation by the ants must be due to the fact that *Atta* accumulates more metals by having permanent nests in the soil, promoting a biomagnification through its trophic chain, while *Odontomachus*, by being predatory and moving in the environment in search of resources, and also due to an efficient metal metabolism system, accumulates less metals. (UESB, NMM/UFV)

3.1.29 PASTURE COVER INFLUENCES COLONIZATION BY LEAF-CUTTING ANTS IN EUCALYPTUS PLANTATIONS

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Commercial *Eucalyptus* plantations in Brazil occupy more than 5.5 million hectares, with a production of millions of tons of wood and derived products. Several factors can contribute to decrease of plantations productivity, being leaf-cutting ants of the genus *Atta* considered a primary pest in these plantations. The foundation of *Atta* nests happens in an event called nuptial flight and it is directly related to dispersion of winged female to colonize new environments. Landscape structure can influence colonization by ants once some environments are more favourable to dispersal movement than others. Thus, we sought to answer the question: what is the influence of the surrounding landscape on the colonization of leaf-cutting ants in eucalyptus plantations? To answer this question, we selected 15 eucalyptus areas, aged between 3 and 4 years, with an average size of 40 hectares, located in the eastern region of the state of Mato Grosso do Sul, Brazil. We obtained the density of nests per hectare dividing the number of new nests by the size of the selected eucalyptus area. We delimited a buffer of 1.5 km from the perimeter of each area and calculated the coverage percentage of the pasture and *Eucalyptus* within the buffer. We performed a GLM analysis to verify the effect of the each land cover on the proportion of nests. The eucalyptus plantations cover did not show a significant effect. However, we found a significant and positive effect of pasture cover on colonization of leaf-cutting ants. Thus, areas of eucalyptus that have more pastures in their surroundings tend to have a greater number of new nests. Ants of the genus *Atta* are commonly found in pastures, being an environment favourable to their establishment. *Eucalyptus* areas are annually managed, including with formicidal baits, making it difficult to establish nests until their reproductive phase. The control of ants in pasture areas is rarely applied, being a more friendly environment, and consequently, acting as a source of new colonizing ants. These results allow us to develop a better planning of the distribution of the areas for eucalyptus plantation, aiming at sites with lower occurrence of ants, which can reduce the cost of control and the use of chemical insecticides. (UFLA, CAPES, Eldorado Brasil Celulose)

3.1.30 TOXICOLOGICAL TEST WITH DIFFERENT CONCENTRATIONS USING THE IMIDACLOPRID ACTIVE INGREDIENT FOR WORKERS OF *ATTA SEXDENS RUBROPILOSA*

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The search for new chemical substances for control of leaf-cutting ants is a constant process, so many companies and research centers use toxicological tests to create and use their assets. It is both effective and environmentally friendly. For this, bioassays were done in the laboratory with the colonies, using two insecticides: imidacloprid and sulfluramid, the latter used as standard. The imidacloprid impregnation (0.01%, 0.1%, and 1%), a sulfluramid concentration (0.1%), and a control treatment (without active), being five treatments, and each with four repetitions. After the pulp-based bait of citrus pulp, the sucrose solution (10%) and the i.a, following the protocol of IN nº 42, of MAPA (Ministério da Agricultura, Pecuária e Abastecimento) for leaf-cutting ants. For this, 1 g of this formulation offered per repetition. After 24 hours, the pasty bait was removed and then a 3.0 cm of fungus garden was placed containing 20 workers to maintain the cultivation of the symbiotic fungus. The authors evaluated the mortality until 21 days. With our results was possible to perform the corrected mortality calculations of the operations in each exercise by the Abbot formula. The results showed: the concentration of 0.01% had an average mortality rate of around 37%, while the concentration of 0.1% had a mortality rate of around 72% and the concentration of 1% killed all workers at the end of the 21-day evaluation. Sulfluramid had an average mortality rate of around 96%. The results indicated that imidacloprid might have some applications in this pest control; however, studies are required for its application.

**3.1.31 INCORPORATION OF DIFFERENT TOXIC BAITS IN
THE FUNGAL GARDEN OF *ATTA SEXDENS*
RUBROPILOSA COLONIES**

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Although there are commercial products to control leaf-cutting ants, there is a need to find environmentally friendly alternative products. Faced with this problem, the present study aimed to evaluate the incorporation of different toxic baits in the leaf-cutting ants fungus garden. Baits were formulated with Neem oil (botanical insecticide, *Azadirachta indica*) and sulfluramid – 0.3%. The experiment was conducted in the laboratory ($T = 25 \pm 2$ °C, $RH = 70 \pm 10\%$). Citric pulp-based bait (negative control) used in the control, consisting of 80% citrus pulp powder; 15% carboxymethylcellulose and 5% soybean oil. The authors used a scale of note with different levels to evaluate the incorporation of the baits in the fungus garden. The levels were classified in level 1 – the incorporation rate in the range from 0 to 25%; level 2 – from 26 to 50%; level 3 – from 51 to 75%; and level 4 – from 76 to 100%. The experiment was conducted in a completely randomized design with two treatments and five replications, each colony was a replicate. The sulfluramid treatment did not differ significantly from the control, with average scores of 3.8. The treatment with Neem oil showed mean scores of 1.8 and this way indicating that this compound has characteristics of deterrence or repellency because in this situation there was some ease of recognition by the ants. Further studies of Neem oil should be done to evaluate the effectiveness in the control of leaf-cutting ants (PPG Proteção de Plantas, UNESP, CAPES, CNPq).

3.1.32 STUDENTS' PERCEPTIONS OF INSECTS: CAN WE SEE ANTS?

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Despite the facts that insects are the most abundant biological group in the planet, are present at all natural and disturbed environments, and have important roles for ecosystem processes playing many ecological functions, they are still neglected, seen as plagues, and animals that promote loathing. The aim of this work was to evaluate students' perceptions of insects in the environment, emphasizing their perceptions of ants. We hypothesized that: i) insects would be the least perceived animals in the environment; ii) among insects, ants would be the most perceived group, for they are present in more environments. The study was conducted with students from the Brazilian 9th grade (middle school), ages between 13 and 14 years old, at six public schools, from three cities of northern Minas Gerais state (Bonito de Minas, Cônego Marinho, and Januária). Each student received an A4 size paper sheet and colouring pencils to make drawings. We asked the students to make a drawing based on the following question: "How do you perceive the environment?". Students had 50 min to hand in the activity. We analyzed 109 drawings considering the proportion of the presence of fauna in general, of insects, and of ants. More than half of the analyzed drawings (59%) included a fauna representation, and among these, 47% included birds, 28% fish, 8% mammals, 6% insects (butterflies, bees, and ants), and only 1% (equivalent to one drawing) included ants. Insects was the least represented group on drawings, even though they are important organisms for environmental functioning and dynamics. As for ants, they were represented on only one drawing, showing that ants were not perceived as part of the environment. This result may have occurred because, although ants are present at houses, the media shows these animals as a prejudicial insect for the environment and the economy (causing damage to agriculture, such as the leaf-cutting ants), or prejudicial to health, such as ants that sting, and cause allergies, for example the ants of the genus *Solenopsis*. Therefore, we highlight the importance of teachers, textbooks, and myrmecologists to use ants as an educational resource, as well as prioritize science diffusion, showing and discussing the key roles of ants to the environment and to ecosystem processes. (CAPES, FAPEMIG, CNPq)

3.1.33 ANTS AS BIOINDICATORS OF FOREST REGENERATION IN THE EAST OF MINAS GERAIS STATE

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Environmental degradation in the eastern of Minas Gerais state was intense with extensive pasture land occupation for livestock rearing. The anthropic actions associated with the natural phenomena caused serious problems in the region from the tops of hills to the beds of the streams. Since the 1980s, communities such as Quilombo de Ilha Funda have implemented actions to recover these areas through an agroforestry system following principles of agroecology and fencing of areas for natural regeneration. The present research analyzes the regeneration process using the ants as indicators. The ant sampling were carried out with pitfall traps distributed in transects with 10 points distant 25m each other in four areas: (i) legal reserve - secondary forest, (ii) natural regeneration - former pasture for approximately thirty years, currently presents vegetation composed of shrubs and grasses, enriched with fruit species (iii) degraded pasture - soil predominantly discovered and eroded, (iv) agroforestry system - pasture where an agroforestry system was implanted in the past, but it was once again used for livestock raising and is degraded with islands of arboreal vegetation. The ant samples were sent to the Laboratory of Ecology, Environment and Territory of the Vale do Rio Doce University for identification of the ants up to genus and then compared with specimens from the collection of the Laboratory of Evolutionary Ecology of Canopy Insects and Natural Succession of UFOP. In order to infer vegetation recovery, canopy opening measurements were also taken from photographs made with hemispherical lens. Although species richness did not present as a good indicator of regeneration, the abundance of ants increased with the canopy opening, reflecting the gradient of environmental degradation. The abundance of ants collected in the soil is proportional to the opening of the canopy, reflecting greater activity in the soil of the areas where there is less canopy structure despite the similarity in the richness of the areas. Species composition differs significantly between areas, especially between the legal reserve and degraded pasture. *Camponotus fastigatus*, a species recognized as a bioindicator of rehabilitation of impacted environments, more frequent in the area under natural regeneration. It should be noted that although this area is called natural regeneration, it is possible to perceive that the people form that community plant useful species, making an enrichment process, which potentiates the recovery indicated by the ants. (Comunidade de Ilha Funda, FAPEMIG, CNPq, CAPES)

3.1.34 ANTS RESPONSE TO THE IMPACTS OF A TRANSHIPMENT SOLID WASTE STATION

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Transshipment areas consist of facilities where the trash is transported from a collecting vehicle to a vehicle with a larger cargo capacity which, in turn, transports the waste to its final destination, the landfill. Transshipment areas bring several impacts to their surroundings, especially when they are located within the urban centre as in the case of Governador Valadares, where it is located between residential districts and a landfill. The present research aims to identify the response of the ants to the impacts resulting from the presence of a transshipment solid waste station. Ants were collected in four continuous areas: (i) transshipment station - where there is a large movement of trucks that deposit and remove the waste on a daily basis, (ii) deactivated landfill - an area used for about 20 years for final disposal of solid waste, (iii) green area - riparian vegetation where it is possible to notice anthropic impact through the presence of garbage inside the forest fragment, (iv) residential area - adjacent to the transshipment station. In each area five collection points were sampled using five pitfall traps per sample. In the first three areas, artificial seeds were also arranged for 50 minutes. The ant samples were sent to the Laboratory of Ecology, Environment and Territory of Vale do Rio Doce University for screening and identification. The results reflect the strong impact of the degradation generated by the solid waste deposit in the transshipment area, which presented only four species, responsible for the greater removal of the seeds available in one of the five points in this experiment. In the green area were identified 13 species, but no seed was removed, while in the landfill deactivated, where there was less flow of people the richness was bigger (16 species), and seed removal occurred in one of the five points. In this way, the transshipment is an abundant source of resources without providing conditions for nesting, therefore ants can nest in the vicinity and foraging on the solid waste. On the other hand, the deactivated area harbours species typical of forest remnants, evidencing the potential for environmental recovery, one that the natural regeneration process therein contributes to the establishment of the myrmecofauna. (FAPEMIG, CNPq, CAPES)

3.1.35 THE ANT I SAW: MORPHOLOGICAL CHARACTERISTIC OF THE ANTS REPRESENTED BY STUDENTS FROM EARLY CHILDHOOD EDUCATION

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Ants are insects which awake the fascination of the children either by its appearance or by its biology. Therefore, these insects in the last decades have gained emphasis in the media, especially in that who is specialized for the children's audience. In this context, the aim of this study was to evaluate how are the morphology characteristics of the ants represented by students from early childhood education. We visited classes of early childhood education which attend children of five years old. In each class, we asked the following question: "Have you ever seen an ant? Could you draw the ant you saw?". This was the only instruction that we gave to the students. Then we analyzed each drawing on the morphologic characteristics of the ants represented by the students: the number of body parts, the presence of antennae, number of legs and the presence of human traits. We visited 11 classes from early childhood education which all together had 163 students in total. Almost half of the students (46%) drawn correctly the ants with three body parts, however, 54% of them represented the bodies of the ants with more or less than three parts. The amount of 53% of the students drew the ants with two antennae while 38% of them drew ants without antennae. About the number of legs, 31% of the ants had been drawn with four legs and only 21% six legs. And finally, 68.7% of the students drew ants with anthropomorphic characteristics. We believe that the main reason that influenced the representations of the ants was the media (printed and digital). In general terms, the media only aim to the recreation, thus the representation of the insects does not follow the biological classification and morphological rules since other invertebrates are classified as insects. Besides, for making insects more attractive or perhaps more acceptable to the children, the media usually represents them with human characteristics and with four legs following the tetrapod body design. In this development level (about five years old) children usually represent their world based on the experiences they have lived. Thus, children who have lately lost contact with nature and spend a lot of time interacting with the different media tend to represent more the mediatic ants rather than the real one. To comprehend how the children, see and represent ants may contribute to educational strategies that reconnecting the students and nature. (PAPq/UMEG)

3.1.36 ANTS TEACHING ABOUT HUMANITY: AN EXPERIENCE IN EARLY CHILDHOOD EDUCATION

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Early childhood education aims to work especially the social development of the students, thereby due to its high social complexity, the ant society has great potential as an educational model for this stage of basic education. The aim of this study was to use the ant society as an educational resource in early childhood education. We worked with six classes of early childhood education in a public school from Poços de Caldas, Minas Gerais - Brazil. Each class received one nest of *Acromyrmex* sp. that remained with them for a month. Over this month the students could observe the ants and taking care of them (under supervision). In each class, weekly, we performed four pedagogical interventions related to the themes: 1) Ethics (respect of differences and teamwork); 2) Hygiene (personal hygiene and with food); and 3) Environment (hygiene of collective spaces). The first intervention was based on the polymorphism presents in the ant nest and how different ants can work together. Through the "game of little balls", we promote discussions on the importance of differences in society construction and the efficiency of teamwork. The second intervention was "the juice of the ants" in which students produced juice using lettuce leaves and orange, simulating the process of fungus cultivation by the ants. During this intervention, we discuss the importance of personal hygiene and hygiene with the food. The third activity was "garbage place in the trash can", in which students collected garbage around the school. In addition, we discussed the importance of garbage collection for the hygiene of collective spaces, relating these attitudes to how ants deal with garbage in their nests. In the last intervention, each class was transformed into an ant nest. We divided the class into six groups of colors and one group of the discoverers, simulating the functions of the worker ants in the nest. The goal of this game was for the students in each group to find the hidden balls in the schoolyard. Following the ant queen's demand, the discoverers' team searched for balls of a specific color and communicated its localization to the corresponding group using only clues. Simulating the foraging of the ants, the students were able to work several social skills. Our partial results showed that the ant society can be used as an educational resource for preschoolers who, through observations and recreational activities, were able to learn about human society. (PAPq/UEMG)

3.1.37 WHAT IS RECOMMENDED TO FIRE ANTS CONTROL IN BRAZIL?

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Colonies of fire ants (*Solenopsis* Westwood, 1840) are easily found in urban gardens and exhibit a peculiar aggressive display when disturbed due to the behavior of stinging their victims, which can promote an allergic reaction and even death in extreme cases. The control of these ants has not yet been consolidated scientifically, however, several suggestions of combat can be easily found on the internet. Thus, this study aims to carry out a quantitative survey of fire ant control recommendations between the years of 1997 to 2019 available on the internet and in the Brazilian bibliography. The survey was conducted in May 2019, in the Google and YouTube platforms, for websites and videos and the bases Web of Science and Google Scholar to scientific reports. The term "how to control fire ants" was used to search for sites and videos already "fire ants, control, brazil" for bibliography. The control methods were separated into the following categories: homemade, chemical and biological control. In all, 38 publications (18 sites, 12 videos and 8 bibliographies) were found, which 18 different methods of control for fire ants recommended. Among the control categories found, the homemade methods were more registered (n = 39), followed by chemical methods (n = 19) and biological control methods (n = 2). In the publications on sites, the most cited methods were the use of substances of plant origin (citrus peels, carnation, etc; n = 7) and the use of toxic attractive baits (n = 6). Regarding the analyzed videos, the most suggested method was the use of detergent/vinegar solution (n = 5). It should be noted that in only one of the 18 videos analyzed, there was the participation of a specialist in the subject, which demonstrates the popular character of this disclosure. Among the bibliographies, the use of diluted hypochlorite solution (n = 3) and insecticides (n = 3) were the most recorded. The results found in this study demonstrate that in most cases, the suggestion for the control of colonies of fire ants is done by specialists. It is relevant to emphasize the importance of checking the efficiency of the recommended methods, as well as their danger to the manipulator and the risks to the environment, in order to promote the use of a safe method. (CAPES, FAPEMIG, UFJF)

3.1.38 WHAT'S THE BEST METHOD FOR CONTROLLING FIRE ANTS IN URBAN GARDENS?

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Given the increase in the numbers of colonies of fire ants (*Solenopsis* Westwood, 1840) in anthropic environments, several practices have been employed for their control, however, there is no consensus on a method that is low cost, efficient, easy application and elicits less impact on the environment. Thus, the objective of this work was to compare the performance of homemade and chemical methods to control fire ants and, through the AHP (Analytic Hierarchy Process) method, to generate a hierarchical index to aid in this decision making. The study was conducted in Juiz de Fora, Minas Gerais state, southeastern Brazil, from July to October 2015. The colonies of fire ants (n=95) were grouped in 4 treatments: T1: Hot water; T2: Water with detergent; T3: Liquid insecticide and T4: Granular insecticide. All treatments were applied only once on the colonies. The criteria used for AHP analysis (n = 9) were chosen based on bibliographic research and based on the authors' expertise. The T2 treatment presented the best hierarchy index (0.67), followed by T1 (0.64), T4 (0.64) and T3 (0.62). Treatment T2 (Water with detergent) presented the best performance in 4 of 9 criteria evaluated, such as impact on vegetation, hazard class, re-entry period and risk of manipulation. The T1 (Hot Water) had the lowest cost per colony, the T3 (Liquid insecticide) presented the highest risk during its manipulation as well as the higher cost per colony and the T4 (Granular insecticide), stood out as easy to apply and with less impact on vegetation. The results of this study allow us to conclude that the efficiency of a control method is not only based on the number of colonies eliminated. Several criteria must be taken into account, since the product used can have consequences for the environment and for the population living in that place, both in the short and long term. (CAPES, FAPEMIG)

3.1.39 DIVERSITY OF EDAPHIC ANTS (HYMENOPTERA: FORMICIDAE) AS AN ENVIRONMENTAL BIOINDICATOR IN CAATINGA AREA

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The edaphic ants, that have the leaf litter as habitat, where the diversity and variety of resources are found, play an important role in maintaining, restoring, aeration and redistribution of nutrients and organic matter of the soil. In the Caatinga, it was verified that the variety of ant species in environments in recovery is similar to preserved areas. However, more studies are needed to better understand the dynamics of the ant fauna in this biome. The present work has the general objective of to analyze the diversity of ants found in areas of the municipality of Paramirim, Bahia. The specifics objectives are to identify the collected ants, to use diversity as a bioindication tool and to verify the diversity, richness and similarity indices between the studied areas. Three areas were evaluated: areas 1 and 2 in Paramirim and area 3 (control) in the Pajeú do Vento district. Pitfall traps were used on 30 sample points defined in each area. These points were 30 meters apart. A data matrix was prepared for the analysis of the results. It was identified 31 morphospecies, distributed in 11 genera and 6 subfamilies. The subfamilies richest in morphospecies were Myrmicinae with 15 morphospecies, followed by Formicinae with 9 and Dolichoderinae with 4. In relation to the genera with highest richness index, it was found *Camponotus*, *Pheidole* and *Solenopsis* with 9, 9 and 5 morphospecies, respectively. These genera are generally related to disturbed environments, being the majority of their species generalists, of nests built on the ground, usually with a few thousand individuals, dominant, hyperdiverse and being among the most aggressive. In the specific richness results, the area with the highest index is 2, (also the most abundant), followed by 1 and 3. For diversity, area 3 was the least diverse, however the other areas had different indices: for Shannon, the most diverse area was 2; but for Simpson, the most diverse was 1. The area 3 obtained the higher dominance index, followed by 2 and 1. In area 3, *Camponotus* sp.2 dominated with 60 individuals collected. This behavior corroborates with the equitability index, in which area 1 obtained a better index, followed by 2 and 3. It verified that in the area 3 (control) the indices were unfavorable, indicating that this area is probably more degraded. (UNEB VI, PICIN)

3.1.40 ANTS IN CILIAR AREAS IN THE MIDDLE RIO DOCE AFTER SAMARCO DISASTER

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The Suaçuí Grande and Rio Doce rivers, located in the eastern state of Minas Gerais, have been intensely degraded since the middle of the last century. In addition, Rio Doce river banks were affected by mining tailings from the Fundão dam, which was broken in 2015. The middle portion of this river basin was, and continues to be, an area neglected by research, which is why the present research investigates the composition of ant species in ciliary environments associated with these two important watercourses, one being directly affected by the mining disaster beyond historical degradation. The hypothesis tested in this work is that the fauna of riparian forests of the Rio Doce, affected by tailings differs from the banks of the Suaçuí river. This study was carried out in six areas, two on the banks of the Suaçuí River and four on the banks of the Doce River, of which they were located upstream and two downstream of the Suaçuí mouth. In each area were arranged 10 points equidistant 25 meters, being available a bait in the ground and a bait in the tree closest to the point for 50 minutes. *Solenopsis* sp, *Monomorium floricola* and *Dorymyrmex* sp, were present only in the baits arranged in the trees of the areas where there was deposition of tailings, while *Crematogaster goeldii* was collected only in the baits of the areas not affected by the tailings. However, in the baits available in the soil there was no difference in the composition of the collected species, with *Wasmannia auropunctata* present in most of the studied areas. Thus, in general the fauna collected from the different segments of the middle part of the basin does not differ greatly between them, being the ants collected in this study typical of environments and degraded. Thus, restoration of the basin demands attention not only for the Rio Doce pipeline, reached by the mining tailings in 2015, but for its historically degraded tributaries. (FAPEMIG, CNPq, CAPES)

3.1.41 ANT BAITING BY AUTONOMOUS DRONE

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Invasive ants cost >\$6 billion annually to global economy. Currently more than a dozen eradication or management programs in Australia will cost >\$400 million over the next 10 years. There have been >144 successful site-level ant eradications completed globally, so eradication is a real option. Multiple bait dispersal methods are used for ant eradications. Hand dispersal is limited to small, accessible areas. Aerial dispersal use helicopters for larger areas but are limited in remote locations due to high cost of transport, especially oceanic islands. Drones may be a solution. The first use of drone treatments in an ant eradication using Australia's largest non-military drone, *The Fazer*, treated a Yellow crazy ant (*Anoplolepis gracilipes*) infestation in November 2017 at Elliot Springs, south of Townsville, Qld. *The Fazer* is a prototype autonomous drone currently being tested in Australia. Most drones carry loads <10kg and are too small to be viable for this work. This drone can carry 30kg and deliver a wide array of payload loads from liquid sprays to large granules. Granular Synergy ant bait and experimental water crystal ant baits were aerially applied at 5kg/ha and 80kg/ha, respectively. The baiting was as successful as previous treatments conducted by helicopter or hand dispersals in other eradication programs. Pre-treatment, Yellow crazy ant abundance was extremely high. Most individuals were killed 12 hours post-treatment, in line with expectations. This eradication project will require multiple treatments over six months. The use of this drone was highly successful as the drone flight paths were computer controlled, more precise than helicopter operations and the bait flow could be monitored live by camera. It is envisaged that drone technology will revolutionise our ability to conduct many ant eradication attempts, especially in remote locations with difficult terrain. (Yamaha Sky Division, Townsville City Council, Lendlease, Hanson Constructions, BMD Constructions and Bush Oasis Caravan Park)

3.1.42 THE “ANTS OF CHILE” PROJECT: AN APPROACH TO ANT SOCIETIES FROM CITIZEN SCIENCE

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Citizen Science is a new and effective tool for the study of biodiversity, which has demonstrated a broad and effective field of action in different taxa with deep gaps of knowledge at both biogeographical and ecological level. This allows obtaining a large number of records, greater than those achieved by particular efforts, in addition to involving the community in the knowledge of local wildlife. This is especially relevant in regions or countries where funds for biological exploration are scarce, which is urgent given the high rate of habitat destruction, local extinctions, and the need for the creation of conservation programs. In a context of massive production of graphic recordings (i.e. photos and videos), due to a population with ever greater access to technology, interested in biodiversity and its problems, these observations must be channeled in a way that is useful in solving them. However, the examples of citizen science applied to insects in South America, because the inherent difficulties on identification and systematic data sampling, are scarce. We started a Citizen Science project in Chile, called “Hormigas de Chile”, which has been a successful experience, using a simple protocol, combining the collection of ants in the field, scientific diffusion, and the use of other platforms (i.e. iNaturalist). Two years after being created, thanks to the records sent to the project, we have discovered two new exotic species in the country, a new native genus for Chile and have recorded novel behaviours and more than ten new myrmecophilies. With more than 50 participants collecting at a national level, citizen science has proven to be a viable alternative and a successful approach to the diversity and knowledge of ants. This success could be done since this group is ubiquitous and recognizable for the population in general. However, for most species in Chile we do not know relevant milestones of their natural history, such as their nuptial flights, periods of activity and diet, and ecological, as their distribution and main interactions. This is where Citizen Science can play a decisive role in gathering the necessary information to generate both scientific knowledge and conservation.

3.2 BEHAVIOURAL ECOLOGY AND ECOLOGICAL INTERACTIONS

3.2.1 AGGRESSIVE ANT SPECIES ARE MORE EFFECTIVE BODYGUARDS, BUT COMPROMISE THE REPRODUCTIVE SUCCESS OF PLANTS BEARING EXTRAFLORAL NECTARIES

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Diffuse mutualisms comprise diverse groups of interacting species that vary in their morphological, physiological and behavioral characteristics. These differences lead to variation in the quality of resources/services that each species offer to its partners. In protective mutualism between plants bearing extrafloral nectaries (EFNs) and ants, more aggressive ant species (dominants) are considered better plant bodyguards, bringing more benefits to the plants monopolized by them over time. Here, we used a meta-analytical approach to understand how the aggressiveness of ant species attending EFNs is related to their quality as plant bodyguards. Our hypothesis is that dominant ant species provide higher benefits to EFN-bearing plants than subordinate ant species. We gathered papers published up to 2018 that experimentally evaluated the influence of ant attendance on focal EFN plants. We identified the ant species responsible for more than 60% of total visits of the EFNs in each study and classified them as dominant or subordinate species according to the literature. We evaluated separately the effects of dominant and subordinate ant attendance on metrics directly related to plant defense and on metrics directly related to plant reproductive success. We also evaluated separately the effect of the ants on the protection of vegetative and reproductive plant organs. The effect size of dominant ants on the defense of vegetative plant parts was 1.36-fold higher than the effect of subordinate ants, although both ants had a positive effect on this parameter. However, only dominant ants have a positive effect on the defense of reproductive plant parts. Despite of it, plants interacting preferentially with subordinate ants had higher reproductive success than plants monopolized by the dominant ones. Subordinate ants forage solitarily while dominant ants forage in group, recruiting workers that monopolize food sources, as the EFNs. Therefore, dominant ants are more efficient in patrolling all plant parts, deterring herbivores at both reproductive and vegetative parts of the plants. However, although dominant ants defend more efficiently the plant against herbivores, it seems that being monopolized by dominant ants impose higher long-term costs to the plants, constraining the plant reproductive success. It suggests that partner quality should not depend only on the per interaction benefit provided, but also on the cumulative costs that individuals of different species impose to their partners. (CAPES; FAPESP).

3.2.2 CARBOHYDRATES REDUCE ANT AGGRESSIVENESS AND ENHANCE COEXISTENCE BETWEEN SUBORDINATE AND DOMINANT ANTS

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Dominant ants are aggressive, highly competitive species that exert a strong influence on the behavior of subordinate non-aggressive ant species. Despite the strong influence on behavior, the aggressive and foraging behavior of dominant and subordinate ants can be modulated by carbohydrate availability, which fuels ant activity. Therefore, it is possible that ants become more aggressive as the availability of carbohydrates increases. If true, it would result in a stronger hierarchical structure of the ant community, with dominant ants monopolizing resources and keeping subordinate ants from using them. In this study, we investigated how the increase in carbohydrate availability influences ant aggressiveness and the subsequent interactions between dominant and subordinate ants. For this, we enriched 20 points of observation in an urban area of Brazilian Atlantic Forest by offering an aqueous solution of corn glucose syrup during three consecutive days. We observed the behavior of different ant species when sharing sardine baits before and after the enrichment. We measured the number of aggressive behaviors and the frequency of coexistence between dominant and subordinate ants in the baits. We collected and identified ants observed in the baits and classified them as dominant or subordinate according to literature and expert information. Contrary to our expectations, ants displayed less aggressive behaviors and dominant and subordinate ants coexisted more frequently in the sardine baits after the carbohydrate enrichment. These results suggest that the increase in carbohydrate availability can lead to a reduction in ant aggressiveness and, consequently, in the intensity of competitive interactions between dominant and subordinate ants. In carbohydrate-poor conditions, ants should defend food sources more aggressively, as there is less energy available to invest in foraging. As aggressive interactions impose high energetic and ecological costs, fighting for food sources can become relatively more expensive as ants can allocate the additional energy to fuel the searching for new food sources. In nature, most of the carbohydrates used by ants come from fruits and nectar, whose availability depends on seasonality and spatial variation of abiotic conditions. Therefore, our results suggest that the intensity of competitive interactions between ants can be modulated by the seasonal and spatial variation in the carbohydrate-rich resources offered by the plants. (CAPES, FAPESP)

3.2.3 INCREASE OF TEMPERATURE CAUSES INCREASE OF TRAVEL SPEED IN THE ANT *Acromyrmex subterraneus molestans*

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Acromyrmex subterraneus molestans Santschi (Hymenoptera: Formicidae) is a leaf-cutting ant which is distributed throughout the tropical, semiarid and equatorial regions of Brazil and is frequently encountered in several different agroecosystems. This species is considered as an important herbivore which can cause severe damages to cultivated plants. It presents adaptive features that allow its survival in warm environments, e.g. it generally nests in shady locations and the colonies can move to new nests if local conditions become unfavorable. Despite these adaptations, temperature is generally believed to be a factor that may limit their locomotor activity. The objective of our study was to evaluate the effect of temperature on the travel speed of the workers. An adult colony of *A. subterraneus molestans* was connected through a plastic tube to a foraging arena that was placed within a BOD chamber maintained at a fixed temperature of 10, 16, 22, 28, 34 or 40°C. The activity of the ants while travelling in the tube was recorded with a camcorder and their speed subsequently measured. The data were then analyzed with linear models to assess the effect of temperature on speed. Our results show that the walking speed of foraging workers increased non linearly with increasing temperature. The walking speed at 34 and 40°C was higher for unloaded ants than for loaded ants (mean \pm SD: 6.39 ± 0.20 and 4.32 ± 0.16 cm.s⁻¹, 4.28 ± 0.16 and 2.84 ± 0.14 cm.s⁻¹, respectively). On the other hand it was very low at 10°C (mean \pm SD: 0.44 ± 0.03 cm.s⁻¹) and this temperature may even lead ants to stop all movements. Along with ceasing to forage altogether, increasing the walking speed at high temperatures allow ants to reduce the length of time they are exposed to warm adverse temperatures. (CNPq, Fapemig, Cenibra, Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) – Finance Code 001)

3.2.4 HOW DOES TEMPERATURE INFLUENCE THE MASS OF LEAF FRAGMENTS TRANSPORTED BY *ACROMYRMEX SUBTERRANEUS MOLESTANS*?

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Acromyrmex subterraneus molestans Santschi (Hymenoptera: Formicidae) is an important herbivorous ant of the Cerrado and Atlantic Forest in Brazil. These ants are known to present particular adaptation to high temperatures. However, the phenomenon of global warming has generated concerns regarding the effect of these temperatures on the foraging of these insects. In fact, temperature is known to be a factor that influences foraging in leaf-cutting ants, especially the mass of the leaf fragments they collect. However, this has so far not been studied in *A. subterraneus molestans*. Yet, this could be important to understand the effect of climate change on its foraging activity and on the quantity of the biomass collected. The objective of our study was thus to evaluate the effect of temperature on the mass of the vegetation fragments collected by *A. subterraneus molestans* workers. In the laboratory, an adult colony was connected to a foraging arena placed within a BOD chamber whose temperature was maintained at differing levels: 10, 16, 22, 28, 34 or 40°C. At each of these temperatures, fifty vegetation fragments transported by ants were collected. These fragments were then dried in an oven at 60°C for 48 hours, and their final mass measured with an analytical balance. The data were analyzed using generalized linear models. The mean dry mass of the fragments transported reached a maximum at 22°C and 28°C (Mean \pm SE: 5.12 \pm 0.37 and 5.72 \pm 0.44 mg, respectively) and was lower at 16°C and 34°C, showing that the range of temperature between 22°C and 28°C is optimal for the collection of vegetation in this ant species. The mass of the fragments at the two more extreme temperatures tested, 10° C and 40°C, was much smaller (2.83 \pm 0.21 and 2.30 \pm 0.17 mg, respectively). Since the speed of laden ants is negatively correlated to the mass of the load they carry, choosing lighter loads at the two extreme temperatures may be a way for ants to avoid reducing their speed, thus allowing them to be exposed for shorter time to detrimental conditions. (CNPQ, Fapemig, Cenibra, CAPES)

3.2.5 INTERACTIONS BETWEEN ANTS AND PLANTS IN THE "ANT GARDENS" OF *Azteca paraensis bondari* BORGMEIER, 1937 (DOLICHODERINAE)

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Azteca paraensis bondari (Dolichoderinae) is an arboreal ant that builds its nests known as "ant gardens" on trees. A single mature colony harbors a polydomic feature, which confers a broad physical structure at the permanent nesting site. Centrally to what it constitutes a true territory, the main nest has a much larger structure and several other smaller nests, known as satellites, are distributed in the surrounding trees. This ant was extremely common in southeastern Bahia's cocoa plantations until the 1950s, when they began to be exterminated by cocoa growers. Despite maintaining a very close mutualism with plants and its especially great biological interest, this ant has historically always been considered one of the main pests of the cocoa agriculture in that region. The ant extracts the gum that protects the gems from the host tree to build the nest, causing drastic dryness of the entire upper part, followed by the tree death. Due to this, *A. paraensis bondari* "ant-gardens" are today rather difficult to be found in cocoa plantations. The ant-garden structure consists mainly of the roots of *Codonanthopsis uleana* and sometimes of *Coryanthes maculata*, and vegetal material taken mainly from the host tree. This experiment was carried out in the experimental grounds of CEPLAC at Ilhéus, Bahia, Brazil, and aimed to understand *A. paraensis bondari* biology focusing on the interactions in ant gardens. Three nests were observed, each of them with a minimum of four calies. Each one was observed during 2h, alternating morning/afternoon, and a series of observations about ant behavior was made focusing mainly on the interactions between the ants and the epiphytes. The roots of *Cod. uleana* confer mainly rigidity to the nest structure, while *Cor. maculata* secretes a viscous nectar that the ants collect during the flowering time. We observed the protective behavior against herbivory to the host tree and epiphytes and the agonistic behavior of the ant workers which raise their abdomen and open their jaws releasing what is apparently an alarm pheromone, generating mass recruitment. The result is that any potential intruder is quickly captured or expelled. The polydomous organization offers benefits to both partners, such as herbivory reduction, permanent control of a large territory of the tree canopy where this species tends sap-sucking insects for their honeydew, and facilitation of social information exchange, which reduces the time for feeding and defense. However, this organization also increases local competition when resources are limited. (FAPESB)

3.2.6 FIRST GEOGRAPHICAL RECORD AND BEHAVIOR OF A RARE AND REMARKABLE ANT, *NEOPONERA MAGNIFICA* (FORMICIDAE: PONERINAE) FROM MATO GROSSO DO SUL, BRAZIL

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Neoponera magnifica is a rare and poorly known species occurring in Colombia and Brazil. Currently, there are no records of natural history of this species. This study presents the first record of *N. magnifica* for Mato Grosso do Sul State (MS), Brazil, and describes some observed behaviors. First, one worker of *N. magnifica* was incidentally collected while sampling for ants in the municipality of Ribas do Rio Pardo, State of Mato Grosso do Sul, in April 2016. The species was identified based on identification keys and confirmed by specialists. After species confirmation, a second expedition was carried out in August 2017, to locate new individuals and the possible nest. For this, we returned to the approximate location where the first individual was recorded. In an area of approximately 30m², we distributed 16 sardine baits placed 5 meters apart. Bait distribution occurred at 09:30 a.m. on the first and second day. Afterwards, baits were observed to verify if *N. magnifica* individuals were attracted, and, in the area surrounding the baits, visual searches were performed to locate some individuals. The located individual was observed in the field, and also in manipulated conditions, at the farm's headquarters. There, individuals were observed in a tray, where we replicated characteristics of their original location, using as leaf litter, twigs, sticks, and tree bark for behavioral observations. All behavioral observations were performed using notes and analyzing videos recorded. Photos and videos were recorded with a Nikon D800E camera, 100mm lens. After the observations, specimens were preserved in 70% alcohol. This new record of *N. magnifica* enlarges their distributional limits. Before this study, the geographical distribution of *N. magnifica* was restricted to Colombia and the five Brazilian States: Pará, Bahia, Goiás, Minas Gerais, and Rio de Janeiro. *Neoponera magnifica* hides beneath the leaf litter while searching for food. We observed and recorded behaviors of locomotion, cleaning, water ingestion, and feeding. We observed that while feeding on sardine baits, this ant preferred to collect the oil than the pieces of sardine. The unusual behavior of rear leg movement at rapid speeds was observed. The behavior of searching for places of refuge may be associated with a less aggressive behavior of the species *N. magnifica*. Observations of rare and poorly known species, such as presented here, provide important information about aspects of ants natural

3. ORAL & POSTER ABSTRACTS

history. (CAPES)

3.2.7 DISTINCT BACTERIAL COMMUNITIES ASSOCIATED WITH THE CUTICLE AND GUT OF *ODONTOMACHUS CHELIFER* (PONERINAE) FROM ATLANTIC RAINFOREST AND CERRADO

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Bacterial communities are the most studied group within all the microorganisms that inhabit multicellular organisms. In ants, this association is important for nutrition, reproduction, and communication. The more ant genera have their bacterial communities uncovered, the more we can understand about the structure and function of these communities in the ecology and evolution of their hosts. There are few studies on ants of the subfamily Ponerinae, despite their importance in tropical ecosystems. One of the most abundant ponerines in Atlantic rainforest and cerrado is the litter-dwelling *Odontomachus chelifer*. Here, we investigate the richness and diversity of bacterial communities associated with this species, comparing different (i) body parts (cuticle and gut), and (ii) environments. We hypothesized that communities would differ between body parts, but would be similar between guts of ants from different biomes due to their similar diets. We also expected differences in bacterial community structure between biomes due to their contrasting biotic and abiotic conditions. We sampled eight *O. chelifer* nests; four in Atlantic rainforest and four in cerrado. We analyzed fifteen workers per nest, whose cuticle and gut bacterial communities were assessed through sequencing the 16S rRNA gene. All the sequences were assigned to an Operational Taxonomic Unit. We compared richness and diversity of bacterial communities from distinct worker body parts and nest locations. Our results mostly corroborated our hypothesis. We found that bacterial communities differed between body parts, with the cuticle presenting higher bacterial richness and diversity compared to the gut. Additionally, there were differences in community structure between biomes for both body parts. Our work shows that each body compartment presents a particular set of bacteria that is constrained and may be differently affected by the environment. For instance, given that the cuticle is in direct contact with the surrounding environment, its community would be prone to constant variation. On the other hand, as also detected in other predatory ants, the low richness of gut communities may result from a less variable environment. Considering that *O. chelifer* ants from Atlantic rainforest and cerrado present similar diets, nesting and foraging behavior, we believe that between-biome differences in their bacterial communities may be due to variable biotic and abiotic factors. This study reveals the richness and diversity of bacterial communities in *Odontomachus* ants in Atlantic rainforest and cerrado, and represents a step forward to understand the role of associated microbiota in the ecology of tropical ants. (Unicamp, FAPESP, CNPq, CAPES)

3.2.8 ARBORIC ANTS SURVIVAL RATES IN AN URBANIZED AREA

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There is evidence that ectothermic organisms adapted to cooler environments or microclimates are less tolerant to high temperatures, a condition known as thermal adaptation hypothesis. However, it is uncertain how thermal limits are imposed on organisms that have differences in their activities during the day. An experiment done with the ants in arid environments has shown that nocturnal ants have lower thermal tolerances than diurnal ants. However, urbanized environments become hotter and more stressful for organisms, as they exhibit higher heat emission and reduced soil evapotranspiration. Thus, we aim to analyze the survival rates of three species of arboreal ants, with different habits of diurnal activities in two temperature conditions. We conducted the study on the campus of the Universidade Federal de Sergipe, São Cristóvão, Sergipe. The average thermal records of the municipality at midday and midnight are 30°C and 25°C, respectively. According to a previous study we determined that *Camponotus blandus* was the species of daytime habit, and *Camponotus melanoticus* and *Camponotus atriceps* were both species of nocturnal habits. For this, we selected six trees where such species co-occur and use the Perry method to collect the ants. The species were collected between 12:00 and 13:00 and between 00:00 and 01:00. Dark chamber experiments were performed to observe the survival time of the species under controlled conditions of temperature and humidity. In a petri dish different group sizes (from 1 to 15 individuals) were placed for each ant species from the same colony and the time when all organisms were dead or inactive was observed. So far only the results of the experiment under conditions of 26°C and 47% humidity will be reported. Survival analysis has shown that in colder conditions, simulating the conditions of nighttime temperatures, the diurnal species dies faster than the nocturnal species. This result may reflect that species adapted to high temperature conditions are more sensitive to temperature decrease and this regulates their activity profile. With the replication of experiments at higher temperatures (35 ° C), information on differences in heating and cooling tolerance will help us to understand their adaptations and the circadian activities of these organisms. The results of this work may contribute to the understanding of how global warming can affect the survival rates and behavior of ant communities associated with urban environments.

3.2.9 SIGNS OF SUBCASTES IN THE WORKER CASTE OF ODONTOMACHUS CHELIFER

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Ants exhibit reproductive division of labor between the queen and worker castes, and may present subgroups of workers called subcastes. However, in the subfamily Ponerinae, only one genus (*Megaponera*) presents morphological subcastes among workers and little is known about this subject on other genera of this group. Therefore, the aim of this study was to test the hypothesis that there are specialized subcastes in the worker caste of the Ponerinae ant *Odontomachus chelifer*. In order to test this hypothesis, we initially collected 5 colonies of *O. chelifer* for construction of the behavioral repertoire of workers of the species. Then, we collected another 6 colonies of *O. chelifer* whose smaller and larger workers were marked in order to assess whether there are significant differences in their behavioral repertoire, body morphometry and composition of their cuticles. For the construction of the behavioral repertoire and assessment of difference between smaller and larger ants, observations were performed by all occurrence sampling method, totaling 100 hours of observations for each step of the experiment. The behavioral repertoire shows that workers in colonies of this species can perform up to 31 behavioral acts that can be grouped into 3 task classes: extranidal, intranidal and others. The results show there is significant difference between the behavioral repertoire and all morphometric parameters tested in smaller and larger workers, with the larger performing significantly more extranidal tasks than the smaller, in addition to some evidence of dominance between the first subcaste compared to the other. The cuticular chemical composition did not differ between the groups. Thus, the results suggest that there are two groups of workers in this species of Ponerinae ant that are morphologically and behaviorally distinguished, being therefore a rare case of subcastes in the worker caste of ants of this subfamily. (UEMS, Fundect, CNPq)

3.2.10 CAN INDUCED MAGNETIC FIELD CHANGE THE INTRANIDAL BEHAVIORAL PATTERNS OF *NEOPONERA INVERSA*?

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Magnetic field is the region of space in which magnetic forces act. The geomagnetic field is an abiotic component with which living beings interact permanently and has been present since long before the emergence of life on the planet. Indeed, some studies have assessed that the magnetic field is perceived and can influence the behavior of several animals such as birds, crustaceans, mammals and even insects. However, although studies report that MF affects the lives of animals, little known regarding how the change of its natural values acts. Therefore, the aim of this study was to test the hypothesis that an altered magnetic field can change the behavioral patterns exhibited by the ant *Neoponera inversa* within their colonies. The effects of altered MF were evaluated in 6 colonies. To change the values of natural MF we used a power source that supplied a pair of Helmholtz coils, placed around the nest chambers. The results show that this species has mechanisms to perceive the changes of MF, since changes in values of natural MF significantly affect the execution of maintenance activities and immature allocation in their colonies. (UFGD, FUNDECT, CAPES e CNPq)

3.2.11 LIFE HISTORY OF TWO ECOLOGICALLY DIFFERENT ANT SPECIES (*CAMPONOTUS RUFIPES* AND *CAMPONOTUS RENGGERII*) IN AN ATLANTIC FOREST FRAGMENT

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Defaunation is an emerging problem in forests around the globe. As a result, not only large species are at risk, but also small invertebrates, even if it goes unnoticed. This group plays many roles in the maintenance of ecosystems by acting on nutrient cycling, soil formation and decomposition. Thus, defaunation leads both to species loss and the loss of basic ecological functions. Understanding the natural history of species like ants, which play many ecological functions, supports conservation efforts, because it allows us to predict and understand patterns of diversity loss. Carpenter ants of the *Camponotus* genus are involved in nutrient cycling, herbivore control and soil formation to name just a few. *C. rufipes* and *C. renggerii* are widely distributed throughout South America, and yet, much of what is known about their ecology is restricted to the Brazilian Cerrado. Thus, the goal of this research is to describe the life history features of both *C. renggerii* and *C. rufipes* in an Atlantic forest remnant. We aimed to describe the architecture and nesting habits, demography, home range and activity schedule of both species and compare this with what is already known about their behavior in the Cerrado. During our research, we observed the nests (N = 7 and N = 8 for *C. renggerii* and *C. rufipes*, respectively) over the course of two months in the hot/rainy season in 2019. Both species were found in an area of recovering tropical rainforest. Additionally, both used straw and dead trunks as nesting material, except for one excavated *C. rufipes* nest. So far, we have made life history observations of *C. rufipes* only, since all identified nests of both species were vacant within a few weeks, hindering the analyses planned the first season. We observed that the species has a primary nocturnal habit, with an increase in activity after sunset (7:00 p.m). Ants moved only a few meter away from their nest (N=3), with an average of 71 cm (min = 10cm, max = 166cm). In the following three seasons, we aim to carry out demographic analyses, restart nest searches and do the observation immediately after to deal with the low persistence of nests. We expect that our study provides natural history data to illuminate the behavior and ecological role of important species, as well understand how these behaviors varies across different ecosystems by comparing our results with those obtained for Cerrado carpenter ants. (CNPq-PIBIC/UNESP, FAPESP 2017/18291-2)

3.2.12 RELATION BETWEEN THE ENDOPHYTIC FUNGI OF *ACALYPHA* AND *COLOCASIA* AND THE LEAF-CUTTING ANTS

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In nature, many organisms keep symbiotic relations, which can positively contribute for the success of both involved. Among them are endophytic fungi, that establish interactions with plants, occupying a niche like phytopathogens, but without causing harm to the host, giving resistance against insect's attacks. The leaf-cutting ants have a strong interaction with the mutual fungus *Leucoagaricus gongylophorus*, by cutting leaves of the plants. These ants prefer some plant species when foraging, such as *Acalypha wilkesiana*, and repel others, like *Colocasia esculenta*. In this way, analyze the diversity of the endophytic fungi of the leaves that are cut by the leaf-cutting ants becomes relevant as it can contribute to clarify the symbiotic inter-relations. The relations between the ants, the plant, the fungus garden and the endophyte can provide an alternative to a better understanding of this species ecology and possible ways of controlling these ants. This work meant to isolate, identify and verify the distribution of the diversity of endophytic fungi that lives between the leaves tissues of *Acalypha wilkesiana*, 'Marginata' and 'Musaica', and of young and old leaves of *Colocasia esculenta* var. *esculenta*, with the support of microbiology and molecular biology techniques. Branches of these plants were collected, sterilized, cut and placed in Petri dishes with Agar Dextrose Potato (BDA) culture medium. After the growing of the endophytic fungi, these were pickled and purified. The identification of the cultures was made by the amplification and sequencing of the ITS region, with the primers ITS1-F and ITS4. The results show, in *Acalypha wilkesiana*, variety 'Marginata', 1 isolated of each genus: *Coniothyrium* sp.; *Nigrospora* sp.; *Xylaria* sp. and *Phomopsis* sp.; and 2 isolated of *Nemania* sp.; *Alternaria* sp. and *Diaporthe* sp. In the variety 'Musaica', it was found 1 isolated of *Alternaria alternata*, *Cochiliobolus* sp., *Diaporthe* sp. and *Colletotrichum* sp.; 2 isolated of *Curvularia* sp., *Pestalotiopsis* sp. and *Phomopsis* sp.; and 3 isolated of *Nigrospora* sp. The young leaves of *Colocasia esculenta* variety *esculenta* revealed the presence of *Hypoxyylon investiens*; and its old leaves presented 3 isolated of *Fusarium* sp.; 2 isolated of *Nigrospora* sp.; and 3 isolated of *Xylaria* sp. These partial results reveal the occurrence of variations of the endophytic between the attractive and repellent plants to the leaf-cutting ants. In the same way, reveals alterations in the composition of the young and old plants. (CNPq, CAPES)

3.2.13 NATURAL HISTORY OF A NEW SPECIES OF THE NEOTROPICAL GENUS *THAUMATOMYRMEX* MAYR, 1887 (PONERINAE, PONERINI) FROM INLAND DUNES OF THE MIDDLE SÃO FRANCISCO RIVER, NORTHEASTERN BRAZIL

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The *Thaumatomyrmex* attract attention by their head morphology with widely spaced frontal lobes and very long, slim and curved mandibles with three long and pointed teeth adapted to the specialized predation on Penicillata (Myriapoda, Diplopoda) found in the studied species. Most species do not have gyne and the colonies found contain less than five workers in average. The genus has a high capacity of adaptation with species found in tropical rainforests and others in semiarid regions. Kempf describing *Thaumatomyrmex* contumax was surprised that a *Thaumatomyrmex* could be found in the Caatinga a biome of xeric shrubland and thorn forest. More surprisingly we found a new *Thaumatomyrmex* species in the inland dunes of the middle São Francisco river, an ecoregion of Caatinga. The vegetation of the dunes is xeric and composed of shrubs and herbs that form island of plant litter. We studied some aspects of the natural history of this new *Thaumatomyrmex*. We searched for foraging workers and we followed them to find their nest. Some nests were observed during daytime and night. We looked for activity at nest entrance, comings and goings with or without anything in the mandibles, types of prey and object bring back and foraging behaviour. The discovered nests are at the base of shrub with one entrance which is decorated with exuviae of Dermestidae larvae (Coleoptera), Penicillata trichomes and some other parts of Arthropoda. The foraging is solitary and nocturnal, initiating after sunset and all foragers return to the nest shortly after sunrise, typical for desert animals. The workers can leave the nest in straight line of few meters and search actively within an area of some hundred square centimetres like other Ponerinae. A few foragers return to the nest with an object or a prey of which *Zygentoma* (Insecta). This is a new surprising diet for ants and for the *Thaumatomyrmex*. It may have a link with the different mandibular morphology of this new species with respect to the other *Thaumatomyrmex*. One colony was collected inside an abandoned termitary on the ground and was composed of nine workers, one male and some immatures. It is a new *Thaumatomyrmex* queenless species, but for a *Thaumatomyrmex* it is a big colony which must be bigger as we can have ten foragers. This species shows even more the incredible capacity of the *Thaumatomyrmex* to adapt to any environment. What will be the next discoveries on these ants? (UNIVASF, CNPq, FACEPE)

3.2.14 NATURAL HISTORY OF A NEOTROPICAL NEW SPECIES OF THE GENUS *PLATYTHYREA* ROGER, 1863 (PONERINAE, PLATYTHYREINI) FROM INLAND DUNES OF THE MIDDLE SÃO FRANCISCO RIVER, NORTHEASTERN BRAZIL

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Platythyrea is a pantropical genus with eight species occurring in the Neotropical Region. The workers are notable for their pruinose sculpturing and rapid movement in the field. Some species are arboreal and others nest on the ground. The colonies comprise twenty to few hundred workers and the *Platythyrea* species are known to present a wide variety of social organization, there are species with gynes, others with gamergates with or without gynes, and one is parthenogenetic. Most *Platythyrea* species are considered generalist predators, but some have a specialized predatory habit on Isoptera, adult Coleoptera or Lepidoptera larvae (Insecta). *The genus has a high capacity of adaptation with species present in tropical rainforest and others in desert regions, thus it wasn't surprising to have found a species in the inland dunes of the middle São Francisco river, an ecoregion of Caatinga biome, in Ibiraba, Bahia, Brazil. The xeric vegetation of the dunes is composited of bromeliads, cactus, shrubs and herbs that form island of plant litter. We study some aspect of the natural history of this new species of Platythyrea. To find their nest we followed foraging workers. The unique nest found was observed during three nights and two daytimes. We registered the comings and goings with or without anything in the mandibles and during the last night we took all preys and materials bring back by the foragers during the twenty first minutes of every hour. The nest was located at the base of the trunk of a shrub below an abandoned carton termitary. There were two entrances, the principal one was decorated with body part of ants, a behaviour found in other social Hymenoptera. The foraging is solitary and nocturnal, initiating after sunset and ending shortly after sunrise, as commonly found in desert animals. The principal prey brought back to the nest was Embioptera (Insecta) that represents a new specialized diet registered for ants. Some foragers return to the nest at a very great speed, maybe with some liquid. Beside the link with the luminosity, the factors that conditions the foraging are not clear. The colony was composed of 129 workers, 9 males and some immatures, thus it is a new queenless species in the genus. In this inland dune system of South America, a new queenless species of *Thaumatomyrmex* has an undescribed predatory habit too. Maybe this particular desertic environment select for original behaviours and more discoveries are expected.* (UNIVASF, CNPq)

3.2.15 ANT ASSEMBLIES ASSOCIATED WITH *TURNERA SUBULATA* (PASSIFLORACEAE) IN URBAN ENVIRONMENTS

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In simplified and potentially resource limited urban environments, carbohydrate-rich nectar produced by extrafloral nectaries (EFNs) could represent a substantial part of food resource needed to sustain and maintain diverse ant communities. *Turnera subulata*, a ruderal shrubby plant widely distributed in disturbed urban areas, is commonly explored by ants due to the presence of a pair of EFNs on each side of the petiole of each leaf. In this preliminary study, we investigated the richness and composition of ant assemblies associated with *T. subulata* EFNs in urban areas of Fortaleza (state of Ceará – northeastern Brazil). The study was conducted from 28/01 to 05/06/2016 (rainy season) in six areas with a more or less pronounced degree of anthropization, and with abundant presence of *T. subulata*. Five of them (with surface ranging from 400 to 8400 m²) were located in the most urbanized part of the campus of the State University of Ceará. The sixth area was the most anthropized, since it was formed by the central bed (a 3 meters width traffic island used by pedestrians and cyclists) of a large and busy avenue, with a length of 3.8 km. Ants were collected directly on the NEFs (sometimes also using beating technique), always in the morning period, with entomological forceps, from a total of 833 plants (245 in the five areas of the university's campus; 588 on the avenue's central bed). The ants were stored in Eppendorf tubes filled with 75% alcohol and properly labeled with a code linked to information about the area, the *T. subulata* plant and the collection date, until identification. A total of 30 ant species (19 on the plants of the university campus, 21 on the plants of the avenue's central bed) distributed in 4 subfamilies (Myrmicinae - 20 spp; Formicinae - 6 spp; Dolichoderinae - 3 spp; Ectatomminae - 1 sp) and 17 genera were found exploiting the EFNs of *T. subulata*. The most representative genera were *Pheidole* (6 spp.), *Crematogaster* (4 spp.), *Camponotus* (3 spp.) and *Cephalotes* (3 spp.). The most abundant species were *Crematogaster quadriformis*, *Brachymyrmex* sp.1, *Paratrechina longicornis*, *Camponotus blandus*, and *Dorymyrmex pyramicus*, whose presence was observed on 25.6%, 25.5%, 18.7%, 18.6 % and 10.2% of the 833 *T. subulata* plants, respectively. On 21% of the 833 plants, more than one species of ants (up to 4) were found exploiting the EFNs.

**3.2.16 INTEGRATIVE APPROACH ON MECHANISMS
UNDERLYING BENEFITS THAT ANTS PROVIDE TO
PLANTS: A LONG-TERM MANIPULATIVE
EXPERIMENT ON THE *CECROPIA-AZTECA* SYSTEM**

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In myrmecophytic systems, the benefits provided by plants to ants are easily recognizable, but reverse benefits can be less obvious, conditional and complex. Environmental variation, ontogenetic changes and the lack of long-term experimental approaches may cause contradictory outcomes. Furthermore, other seldom studied mechanisms besides anti-herbivore protection may better explain how plants benefit from ants' presence. Here, we aimed to understand ant benefits to their host plants. We planted individuals of *Cecropia glaziovii*, from which 36 were able to be divided in two groups (colonized by *Azteca muelleri* ants and experimentally uncolonized individuals). We monitored tree development, colonization, defensive and nutritional features from the onset of the experiment to 54 months. We quantified effects of ant colonies on plants, including plant growth, herbivory levels, fungal infection on trichilia, fertilization via ant debris and changes in physical and chemical defenses. We compared plant features in trees before and after ant colonization to understand whether the colonization preferences are random or biased by plant traits. The presence of ants significantly increased tree height by 125% and leaf number by 123% after colonization compared to uncolonized individuals. This benefit is associated with multiple, complementary positive effects of ants, including a decrease in herbivory by 83%, and protection against fungi, reduced physical (trichomes) investment, and 65% increase in leaf nitrogen and altered stable isotope composition, suggesting an effect of fertilization by ants. Our results experimentally confirm and quantify the ants' benefits for myrmecophytes, and we can exclude a possible alternative explanation that ant colonization is biased towards healthier plants, as their size and other traits were similar to uncolonized plants. Moreover, we differentiated among ant effects (i.e., ant fertilization and energy savings by reducing physical defenses) in a single experimental study, which give us a more complete picture of complex mechanisms besides anti-herbivore defenses. (FAPEMIG, CAPES, CNPQ)

3.2.17 SEASONAL VARIATION OF THE WEIGHT AND SIZE OF VEGETATION FRAGMENTS FORAGED BY *Atta laevigata* (SMITH, 1758)

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Leaf-cutting ants of the genera *Atta* and *Acromyrmex* are considered the main forest and agricultural pests in Latin American countries, especially in Brazil. The foraging of these ants is highly influenced by environmental conditions, mainly air temperature and humidity, which change with seasons. In this context, this study aims at evaluating the weight and size of the fragments foraged by ants in each season. The study was performed in 4 year old *Eucalyptus urophylla* plantations located in the municipality of Curvelo – MG. All vegetation fragments carried by ants returning to their nest were collected with a forceps during two minutes every two hours, during a 24-hour cycle. They were then dried at 60°C in an oven for 48 hours, weighed with an analytical balance (sensitivity 0.0001g), and scanned with a flatbed scanner (HP Photosmart C4200 series) at a resolution of 300 dots per inch. The software Image J was used to measure the fragment area. The average mass of the fragments differed between seasons. Fragment mass was higher in winter and spring (0.1673 and 0.1252g, respectively) than in fall and summer (0.0816 and 0.1142g, respectively). The average area of the fragments was also different between seasons, following the same pattern as their mass. The fragments were larger in winter and spring (0.0177 and 0.0149cm², respectively) and smaller in fall and summer (0.0094 and 0.0106cm², respectively). Overall, there was thus a variation in the vegetation biomass collected per ant between seasons, with the highest value observed during winter. (CNPq, FAPEMIG, Vallourec Florestal)

3.2.18 REFUSE DUMPS NEST OF LEAF-CUTTING ANTS IMPROVE THE PERFORMANCE OF PLANTS IN BRAZILIAN CAATINGA

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Leaf-cutting ants (LCA) are considered ecosystem engineers due their role influencing the availability of resources and creating habitats to other species. One example of this occurs during nest excavation, where LCA change soil attributes which have the potential to affect plant communities. Here we investigate the role of external nest refuse dump to germination and performance of plant species in Caatinga. We first selected 10 nests of *Acromyrmex balzani* and collected soil from the nest (mound and refuse dumps) and control areas of Catimbau National Park. Our experiment was conducted in a greenhouse where we used seeds from three plant species locally abundant (*Cenostigma microphyllum*, *Croton argirophyloides* and *Croton heliotropiifolius*). 20 seeds of each plant species were placed to germinate in the soils of each different treatment (mound, refuse dump and control). After six months, we measured the following morphological traits: above and below ground mass, fresh and dry leaf mass, fresh and dry stem mass, fresh and dry root mass. We found no differences in germination rates between the treatments, 35% of the seeds germinated in refuse dumps, 31% in the mounds and 34% in the control areas. However, all the morphological traits were higher in plants that grew up on the refuse dumps soils than those that grew up on the mound and control areas. Our results indicate that refuse dumps soils of LCA nests increase the performance of plants. Probably this pattern should be associated with improved physical and chemical soil conditions in refuse dumps. Previous studies have indicated that the refuse dumps have a high amount of phosphorus, as well as high cation exchange capacity and field capacity. All these physical and chemical parameters favour the development of plants. Our finding highlights that the presence of external nest refuse dumps composed of organic waste and the temporal dynamic of nest activity of LCA species in Caatinga can represent an important opportunity for the plant establishment. This is particular important considering that Caatinga vegetation is under negative scenarios of increasing human disturbances and aridity, and LCA proliferate in these scenarios. (FACEPE, CNPq, CAPES)

3.2.19 THE “ANT-GARDEN” OF THE DOLICHODERINE *Azteca paraensis bondari* AS A BIODIVERSITY MICROCOSM IN COCOA PLANTATIONS OF SOUTH-EAST BAHIA, BRAZIL

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Ant nests provide an environment favorable to the maintenance of various life forms, including other invertebrates and sometimes vertebrates. Organisms maintain association with ants in search of protection, shelter, food and phoresy, among other benefits, and sometimes some of them may mimic the ants' body form. Each ant species builds and explores its nest in a different way in a range of habitats, extremely diverse according to the stratum where it is found; the numerous invertebrates which live there take advantage of a range of available niches aiming a great diversity of these animals to live simultaneously. We studied the interactions between the arboreal dolichoderine *Azteca paraensis bondari* Borgmeier, 1939, known as “formiga-de-enxerto”, an economically important pest of cocoa plantations of southeast Bahia, and its commensals living in its “ant-garden” structured essentially by the roots of the Gesneriaceae epiphyte *Codonanthopsis uleana* growing in suspended soil cumulated by the ants and responsible to scaffold the nest. Three ant-gardens were collected in a cocoa plantation at the Floresta farm, Japú district, Ilhéus, Bahia. After first reducing activity of the nests' habitants by frozen, the fauna was fixed in ethanol, and then screened at the Laboratory of Social Invertebrates of UESC at Ilhéus. Most of these organisms were identified at the family level. None representative of two groups of invertebrates, Annelida and Mollusca, was noted nor, surprisingly, none Myriapod, however between the most constant classes of invertebrates found in nests of ground-dwelling ants. Only arthropods (Acari, Collembola, Coleoptera, Crustacea Isopoda, Diptera and Hemiptera) were observed, between them many immatures, most of them concentrated in the nest center. The exception was that many mites found at the periphery of the ant-garden, while a great diversity of Diptera larvae were observed in contact with the host plant roots. The commonest beetle families (larvae and imagoes) were Anobiidae, Ciidae, Hydroscaphidae, Ptiliidae and Staphylinidae, while the larvae of Diptera belonged to the families Bibionidae, Ceratopogonidae, Muscidae and Sciaridae. It is possible that the set of factors such as the structure of the ant-gardens, the stratum where these arboreal nests are located and the aggressive behavior of the workers, acts as a mechanism of selection of many organisms allowed to live in these nests. On the other hand, our study draws attention to the occurrence of many larvae of Ceratopogonidae, a family that includes the pollinators of the cacao tree. (CNPq).

3.2.20 SEEDS REMOVAL BY ANTS IN AN INTERIOR-BORDER GRADIENT IN ATLANTIC FOREST FRAGMENTS

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Modifications in the border of forest fragments generated by contact with the matrix are called "border effects". This effect can change the microclimate, ant composition and their interactions with the seeds. The reduction in seed removal may influence the structure of plant communities because ants play an important role in secondary dispersion, being considered one of the "key" groups for the maintenance of ecosystem services. The objective of this study was to evaluate whether seed removal by ants was influenced by the border effect in Atlantic Forest fragments. Two transects were allocated from border to interior of the fragment, where 10 observation points were established with 10 artificial seeds each one. The points were observed every 2h30 min, and three observations were made. Seeds not removed were collected and accounted, and a new set of seeds was put at each point at each observation. To determine if there was a difference in the percentage of seeds removed along the gradient, tests of generalized linear models were performed on the seed removal in relation to the sampling points and in relation to the time intervals between the samplings. A second analysis was performed to evaluate the effect of time interval on seed removal. There was a difference in seed removal between the border and the interior of the fragment. The removal was greater at the border, probably due to the different vegetation found around the points located in the interior and border and because it was a small and simplified fragment. Simplified environments generally shelter less richness and diversity of ants, and present a fauna composed of species of generalist habit. The interior of the forest is the more homogeneous environment for the microclimatic conditions and more heterogeneous in comparison to the vegetation, presenting a less generalist myrmecoph fauna. Therefore, the interior presented less amount of seed removal than the border. The study of habitat fragmentation effect is important because the size and conservation of the fragment are factors that directly influence the foraging activities of ants, which are essential in the maintenance of ecosystem services. (This study was financed by the Coordenação de Aperfeiçoamento Pessoal de Nível Superior -Brasil (CAPES) – Finance Code 001, Fapemig, CNpq.).

3.2.21 IS THE REMOVAL OF DIASPORES PERFORMED BY ANTS INFLUENCED BY ENVIRONMENTAL TEMPERATURE AND MOISTURE?

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Diaspores dispersal is an extremely important ecosystem function because it can decrease competition with the mother plant and increase spatial distribution of the species. The secondary removal of diaspores is carried out by several biotic agents, among which the ants constitute one of the most relevant groups. Environmental temperature and moisture have a positive relationship with ant activity. Considering the importance of this function and its relationship with climatic variables, our aim was to evaluate the effect of temperature and humidity of the environment on the removal of diaspores by ants. Our hypothesis is that the higher the temperature and moisture, the greater the removal of diaspores. To test this hypothesis, we established four sample points spaced 20 meters apart in 28 areas in the states of Minas Gerais and São Paulo, all of which are in the Atlantic Forest domain. At each point we provided 100 artificial diaspores for 24 hours. To measure temperature and humidity, we used a datalogger (model skdl-32) installed in the center of the transect. Every half hour the datalogger measured temperature and humidity. We used generalized linear models to analyze if the variables: minimum, maximum and average temperature and minimum, maximum and average moisture affect the removal of diaspores by ants. The observed temperature variation was between 10 and 35°C with an average of 18.45°C, while the humidity remained between 80 and 98% with an average of 96.85%. None of the variables had an effect on the number of diaspores removed by the ants. We believe that changes in temperature and humidity may have affected some species, but since the removal we observed is a result of removal by several species, the mean removal in the area was not affected by such changes. Tests of how changes in temperature and moisture affect the activities of different species of ants can help us understand a little more about the subject. In this way we conclude that changes in temperature and humidity in the studied magnitude will not directly affect the removal of diaspores by ants in the Atlantic Forest domain. (CAPES, CNPq)

3.2.22 VARIATION IN THE EXTRAFLORAL NECTAR SECRETION OF *PITYROCARPA MONILIFORMIS* (LEGUMINOSAE) MEDIATING THE PLANT-HERBIVORY-ANT INTERACTION IN BRAZILIAN CAATINGA

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Interactions between extrafloral nectaries-bearing plants and ants are characterized by being facultative and generalized, and may vary over time and space. One of the sources of variation of this type of mutualism are alterations in the characteristics of the extrafloral nectar (EFN) secreted by the plants. The objective of the present study was to investigate how the secretion of EFN influence the ant attendance at extrafloral nectaries and their anti-herbivory defense to individuals of *Pityrocarpa moniliformis*. Additionally, we also investigated whether there is a temporal variation in the nectar secretion and number of interactions between ants and extrafloral nectaries in an area of Caatinga located in the Catimbau National Park, Buíque, Pernambuco. We first measured the volume and concentration of the EFN from 39 *P. moniliformis* individuals, and then we evaluated the abundance and richness of the attendant ants and verified the anti-herbivory protection that these ants confer to the plants measured by the number and time spent to attack to simulated herbivores (termites). In order to evaluate the temporal variation of nectar secretion and interactions, we compared the mean of the nectar volume and concentration of EFNs, including in the models the mean values of precipitation and temperature corresponding to the survey period of each year (2017 and 2018). The same was done to evaluate the temporal variation in the number of interactions, where we compared the ant abundance and richness, as well as the number and time of herbivore attack between 2017 and 2018. In total, we found 122 ant individuals of eight different species foraging in the *P. moniliformis* EFNs, which confer eight attacks (4.10%) to herbivores. These attacks take on average 7.42 ± 1.79 minutes. Our results show that individuals who secrete nectar in larger volume attract more ants, and individuals who secrete more concentrated nectar are more defended by the ants. We found a temporal variation in the nectar volume, but this variation was not related to differences in the precipitation and temperature of the studied years. However, we observed that ant abundance and richness were higher in 2017, a year with lower average precipitation when compared to 2018. Our study provides evidence that the attraction and protection of the ants are reinforced by the investment in the EFN reward in terms of quantity and quality. We also showed the influence of abiotic factors such as precipitation on the attractiveness of the ants in *P. moniliformis* individuals. (UFPE, CNPq, PELD-Catimbau)

3.2.23 PARASITISM BY PHORIDAE FLIES ON FORAGER AND EXCAVATOR WORKERS AND DEFENDERS OF THE LEAF-CUTTING ANT *ATTA LAEVIGATA*

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Phorid parasitoids have been investigated as potential agents for the sustainable suppression of *Atta* and *Acromyrmex* ants. The study of parasitic behavior is crucial for understanding the ecology of host-parasitoid interactions. Phorids are commonly seen attacking forager workers of *Atta* spp. near the feeding hole and along the *trail* up to the plant-cutting area. Workers collected from those sites and reared in laboratory may demonstrate parasitism by phorids. However, there are no reports of phorid attacks on *Atta* spp. near the nest entrances on the mound of loose earth nor even if those workers demonstrate parasitism by phorids. The phorid species and their parasitism rates among *Atta laevigata* workers collected on mounds (*excavators and defenders*) and on foraging trails (*foragers and defenders*) were compared. The study was carried out in the municipality of Palmas, Tocantins State, Brazil between February 2018 and January 2019. Fifteen samples were taken, approximately, every 20 days from 18 colonies of *A. laevigata*. In each sampling, from three to seven colonies were sampled, being collected about 530 workers, excavators and *defenders* from two mounds, as well as workers and *defenders* along two more active foraging trails of each colony. In the laboratory, the workers were placed on plastic trays, which were kept in a climatic chamber ($25 \pm 1^\circ \text{C}$; $85 \pm 5\% \text{ RH}$). The ants were fed until they died with a honey solution (50%) imbedded in cotton swabs that were replaced every three days. For 15 days, dead workers were removed daily to observe signs of parasitism by phorids and monitored until the flies emerged. A total of 21,254 workers were collected from the trails and 14,649 workers were collected from the mounds. The number of parasitized workers from the trails was 1,112 (5.23%), consisting of 1,100 foragers and 12 *defenders*. From the mounds, only 27 ants (0.18%) were parasitized; these corresponded to 25 excavators and two *defenders*. Among the parasitized workers from the trails, 514 were hosts to *Apocephalus attophilus*, 251 to *Myrmosicarius grandicornis*, 185 to *Eibesfeldtphora erthali* and 162 to *Apocephalus vicosa*. Among the workers from the mounds, 15 were parasitized by *M. grandicornis* and 12 by *E. erthali*. Therefore, phorid parasitism was much more frequent among the forager workers when compared to the excavators, and scarce among the *defenders*. Different reasons for the exclusive parasitism of excavators by *E. erthali* and *M. grandicornis* and of *defenders* by *E. erthali* and *A. attophilus* are discussed. (CNPq)

3.2.24 COLONIAL GARDNERS: PRUNNING IN ANT-GARDEN EPIPHYTES

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Ant-gardens are among the most complex mutualistic interactions involving ants and plants, in this case, epiphytes. In this interaction, the epiphytes provide support for nest expansion while controlling moisture through the roots and, in some cases, also food resources. In return, the ants can plant epiphytic seeds, provide nutrient-rich substrates, and protect against herbivores. Only 0.34% of the epiphytes that occur along the neotropical region are involved in this interaction. For this reason, we decided to investigate why other species of epiphytes do not grow in Ant-gardens. We suggest that ants prune non-mutualistic plants. Therefore, we conducted experiments in pristine and reforested forests located in Fazenda São Nicolau, municipality of Cotriguaçu-MT, Brazil. In these experiments, we introduce seedlings of cucumber (non-mutualistic plant - NMP) and of mutualistic plants (MP) on different ant-gardens. Although the identities were not parameters for seedlings selection, we used seedlings of *Peperomia macrostachya* and *Codonanthe calcarata*. After 15min, 3 and 24 hours the fixation of the seedlings, we checked the removal of seedlings on the experimental Ant-Gardens. The removal ratios were calculated, and t-test performed to determine if the removal rate of NMP was superior to the removal of the MP. We verified that the removal of seedlings from the NMP was higher than the seedlings of MP (NMP= 58, MP=9). The removal rate after 15 min (N = 7) or 3 hours (N = 10) was exclusively done in NMP. During the first removals, we observed that the ants pulled the seedlings until they were removed from the nest and dropped. After 24 hours some NMP were with leaflets cut or removed. Our results corroborate studies showing that ants in ant gardens recognize the seeds of their MP and then plant these seeds in their nests. The ants recognize chemical signs of herbivory in their mutualist plant, leading to believe that the recognition of the seedlings present in the nests is done by the same mechanism. In conclusion, our data demonstrate that ants of Ant-gardens control the establishment of other plants that come to colonize the nests. (UNEMAT, FAPEMAT, ONF Brasil).

3.2.25 ANT-MIMICRY IN SPIDERS OF THE SOUTH OF THE STATE OF BAHIA, BRAZIL

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Mimicry is a phenomenon in which a species possesses characteristics that evolved specifically to resemble another unrelated one and confers to it a selective advantage. There are three main types (aggressive, batesian, müllerian), and many organisms take advantage from this type of adaptation. It has been documented that some spiders present sexual dimorphism so evident that males and females of the same species mimic different genera of ants. Spiders also exhibit transformational mimicry, in which the same individual mimics different genera of ants while changing their degree of development. Ants are numerous and often aggressive animals that are avoided by generalist predators. Therefore, resembling an ant, the mimetic animal can avoid an attack or go unnoticed, mingling with the ants to participate in foraging. Studying mimetic animals and their models allows understanding ecological and evolutionary relationships in the community. This study is a catalog of spiders that mimic ants of the CPDC collection (CEPEC/CEPLAC), collected in municipalities in southern of Bahia. This catalog presents information on biogeography and biology of mimetic spiders and their ant models. We analyzed 104 mimetic spiders belonging to 11 genera and 4 families. Images in dorsal, lateral and frontal view were captured through the system: Multifocus Leica MDC2900 + camera + Leica Software Las Automontage System 4.4. The images were treated in Photoshop7.0.1. The similarity between mimetic species and model ants was defined based on the authors' perception of the specimens' morphology. Subsequently, the biology and biogeography of the species studied were compared based on the literature. Eight groups of model ants were obtained. The model ants have populous colonies and are present where the spiders were collected. The most frequent ant among the spiders studied was that of the Ponerinae subfamily, perhaps because they are predatory ants, which actively exploit all the habitats within their foraging area and defend themselves aggressively using their sting. The other groups belong to the genera *Cephalotes*, *Camponotus*, *Crematogaster* or *Dolichoderus*, typically non-aggressive ants but some of them with passive system of defense against predation (spines or repellent for example), that tolerate other animals inside the nest or are associated with sucking insects. The genus *Eciton* is also noted, with nomadic, populous and aggressive predators. The most common mimetic features were constrictions, color or hair patterns in specific regions of the cephalothorax, which induce the observer to perceive a third tagma (head, thorax and abdomen) and body elongation. (CNPq)

3.2.26 PREDICTING THE NUPTIAL FLIGHTS OF *ATTA SEXDENS* (LINNAEUS, 1758) (HYMENOPTERA, FORMICIDAE) TROUGH COMPUTACIONAL MODELLING

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The nuptial flights of leaf-cutting ants, genus *Atta*, occurs in specific climatic conditions, which winged males and females leave the adult colonies for the mating process, in order to increase the genetic variability of the population and it perpetuate. The prediction of this event allows the monitoring and the application of most effective methods of control. Thus, we estimated when the nuptial flight of *Atta sexdens* occurs, based on climatic information and meteorological forecasts, through the construction of a computational model that involves data analysis. An analytical model was developed that uses specific punctuation functions and climate information, in a process of optimization, cost and their interactions, then a computational tool was developed to find the best solution for the problem. The climatic data used to calibrate the software were collected over four years (2006 to 2009) from the Meteorological Station (Campbell Scientific Inc. model CR23X) of the FCA/UNESP, Botucatu, SP, Brazil (22° 50' 48" S; 48° 26' 06" W); height (817.74 m). The inputs, such as temperature (°C), relative humidity (%), rainfall (mm) and wind speed (km/day), were used to create a score function that predicts the occurrence of the event. The calibrated model was applied to the climatic data collected from 2014 to 2017 in the Meteorological Station of the CCA/UFSCAR, Araras, SP, Brazil (22° 18' S; 47° 23' W); height (690 m). The algorithm was transcribed into a computer application that allows a quick interaction with the user. The optimization model was sufficiently sensitive and able to determine a maximum point, in terms of scoring, on the date on which the mating occurred. With this study, we could understand better this process, but further simulations need to be performed to improve the model optimization. Thus, we will can assist other researchers in collecting queens, as well as applying control methods.

3.2.27 SOCIAL NETWORKS IN *ACROMYRMEX SUBTERRANEUS SUBTERRANEUS* AND IN *ACROMYRMEX SUBTERRANEUS MOLESTANS*

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Task allocation is a typical behavior of leaf-cutting ants, insects that are distributed in castes that interact to benefit the colony. An interesting tool that demonstrates the structure of the interactions between members of the colony is the theory of networks, which quantifies local and global properties that characterizes the composition and the actions of the interlinked units. The objective of this work was to delineate the social network between workers of *Acromyrmex subterraneus subterraneus* and *Acromyrmex subterraneus molestans*. Five mini colonies of these subspecies (250 ml of fungus garden) were utilized in the bioassays. The worker castes were determined based on size, task and location in the colonies: the minimal workers, the foragers, the generalists and the waste workers (n=30 individuals/colony). The gaster of the ants was marked with a Testor© ink. The evaluation consisted of studying the behavior of antennation (antennal touches between individuals) executed by the workers beginning with the offering of the plant *Acalypha wilkesiana* Müll Arg. The network thus designed represents the meetings between individuals of different castes, when the individuals were connected to one another when touched (within and among castes). Interaction data were inserted into adjacent matrixes and analyzed using the *igraph* package of the R software. Normality and homoscedasticity of the social network data were checked and later submitted to a generalized linear model. In the social arrangement of *Acromyrmex subterraneus subterraneus* we demonstrated a strong clustering between foraging workers, the generalists and the waste workers, showing a high interaction between the foragers themselves and the grouped castes, with the exception of the minimal workers. In the community *Acromyrmex subterraneus molestans*, we found an integration among almost all the castes, with high interaction between foragers, generalists and waste workers when compared to the minimal. We also found a smaller variation among the group parameters, with a similar proportion of connections among castes (density) and mutual connections (reciprocity) between subspecies. However, the indication of possible grouping (transitivity) was different between the subspecies; this suggests a greater grouping between castes of *Acromyrmex subterraneus subterraneus* when compared to *Acromyrmex subterraneus molestans*. As far as individual parameters are concerned, the degree of centrality was similar between the subspecies. The knowledge about the interaction shown within and among the different castes in the social networks of leaf-cutting ants will contribute to an effectively directed management of these ants via the use of more specific and caste-targeting molecules. (CNPq)

3.2.28 EFN-BEARING PLANTS INFLUENCE ABUNDANCE AND COMPOSITION OF ARBOREAL ANT COMMUNITIES IN BRAZILIAN CAATINGA

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Ants are commonly found exploring extrafloral nectaries (EFNs) and predating other insects in EFN-bearing plants. This relationship comprises a facultative mutualistic interaction, since the ants benefit from the extrafloral nectar and in turn protect the plant against herbivory, increasing both ant and plant fitness. Despite the fact that extrafloral nectar is a key food resource for arboreal ants, there is no consensus about its role in structuring arboreal ant communities. Moreover, there are many evidences that ant-EFN bearing plants interaction are most commonly found in dry regions due to environmental constraints, increasing the importance of this resource in these regions. The present study aimed to investigate if and how the presence of EFN-bearing plants is driving the arboreal ant communities in Caatinga dry forest vegetation of northeastern Brazil. The study was carried out in the Catimbau National Park, where we sampled all the plants with or without EFN in nine plots (50 x 20 m). In each plant, we collected the ants using entomological umbrella and beating the plant branches above it. The samples were repeated four times during the rainy season. We found 188 ants from 17 species, being 124 ants from 18 species in 11 EFN-bearing plants species and 64 ants from 15 species in 17 plants species without EFNs. The most common ant species was *Cephalotes* sp1, occurring in 58.3% of the EFN-bearing plants and 32.2% of the other plants. Our results showed that the abundance but not richness of ants visiting EFN-bearing plants was higher in EFN-bearing plants than in plants without EFNs. Additionally, the composition of ant species visiting EFN-bearing plants also differed between plants with and without EFNs. Our results suggest that extrafloral nectar is an important factor driving arboreal ant communities, which may have implications for the protection services in Caatinga flora, given that about 30% of the Caatinga flora is composed of EFN-bearing plants (CAPES, CNPq, FACEPE).

3.2.29 COMPETITION BETWEEN COLONIES IN A NON-TERRITORIAL ANT

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The competition among individuals of the same species or not, to access food resources, territory or reproductive partners comprise a set of costly behaviors. In social insects, the establishment and maintenance of territories or home range are based on a complex communication system. In this study, our aim was to analyze the competition between neighboring colonies of *Dinoponera quadricaps*. We hypothesized that travelled distance in *D. quadricaps* varies according to colony size; and, agonistic interactions among individuals from different nests vary according to distance from the nest entrance. Three neighboring colonies of *D. quadricaps* were chosen within the secondary Atlantic Forest of the FLONA of Nísia Floresta/RN, northeastern Brazil. The observations occurred between May and August 2018, two days/week, ten hours/day. Once an ant left the nest, we observed it until it returned to the nest. Only then we would start a new recording session of a new individual.

Agonistic interaction and chemical marking behaviors were recorded through “all occurrences” method. The displacements and places where these behaviors occurred were marked. Our findings indicate that *D. quadricaps* nests have large foraging areas and those tend to form wide intersections with neighboring colonies areas. Colony size had no effect on the distance traveled by foragers. Chemical marking and agonistic interaction behaviors were more frequent at the limits of each area. However, no significant difference has been found in nest proximity and overlap or non-overlap area. Features of the competitive behavior of *D. quadricaps* have been found in other ant species which are probably related to a decrease in the costs for active defense of a fixed territory. Studies of competition in queenless ants, that perform individual foraging, are fundamental for demonstrating the evolutionary mechanisms of cooperation and communication in such a diverse group. UFRN, CNPq, CAPES)

3.2.30 SOCIAL STRUCTURE OF CARE WORKERS IN *DINOPONERA QUADRICEPS*

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Social communication is a fundamental mechanism for maintaining the efficiency of collective work. However, this sophisticated system does not exclude conflicts. In *D. quadriceps*, the care workers are the youngest and among those in the highest rank within the colony. Few studies explore agonistic interactions as part of the social structure, and they usually focus on foragers. The objective of this study was to verify the social structure of the care workers of *D. quadriceps*. We hypothesized these individuals were involved in both agonistic and affiliative interactions. We predicted many agonistic interactions would be recorded while affiliative interactions would occur less frequently. The study was carried out at the Behavioral Biology Laboratory-CB-UFRN, Natal, northeastern Brazil. A nest was filmed for six consecutive hours. We recorded all care workers' social interactions through continuous focal method. Care workers were the individuals in direct contact with immatures. Our results showed that the care workers interacted in an affiliative way only a few times. These interactions were between them and also with a small number of workers who performed their activities close to the immatures. Care workers presented a greater number of agonistic interactions that indicated a dominance hierarchy. The probable alpha individual performed most of the aggressions, targeting apparently the younger individuals. Thus, studies like this are important once immature care behavior is closely related to reproductive potential. (UFRN, CNPq, CAPES)

3.2.31 BEHAVIORAL PLASTICITY AND A NEW PERSPECTIVE ON POLYETHISM IN FORAGERS OF *ATTA ROBUSTA* (HYMENOPTERA: FORMICIDAE)

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The ant *Atta robusta* is an endemic species of the restinga of the states of Rio de Janeiro and Espírito Santo that forages a wide variety of plants in this ecosystem. This study aimed to determine if the division of labor occurs in the worker caste of *A. robusta* when this explore different plants species. One nest reared in laboratory conditions was connected to a foraging arena where was offered to the ants *Schinus terebinthifolius* (brazilian pepper-tree) or *Cereus fernambucensis* (cactus). Workers ants foraging the plants were observed during 30 minutes and marked with different colors according to the performed task. Three tasks were identified when the ants foraged the brazilian pepper-tree: 1. leaf petiole cutting, 2. leaf fragments cutting and transporting, 3. Leaf fragments transporting. Two tasks were identified when the ants foraged cactus: 1. Cladode cutting and 2. Cladode transporting. The head width of each worker performing some specific task was measured when foraged brazilian pepper-tree (n = 40) and cactus (n = 100) and individuals were grouped in five size classes: I. 1-2 mm, II. 2.1-3mm, III. 3.1-4mm, IV. 4.1-5 mm and V. ≥ 5.1 mm. Ants were also categorized by the wear of mandibles according the number of broken or very worn teeth. Tasks division of the worker caste was verified during foraging of both species plants. When the ants foraged brazilian pepper-tree the division of tasks was not related to polymorphism because the same size classes of workers performed the different tasks. However, foragers cutting leaves had mandibles with less damaged teeth than foragers that were only transporting fragments leaves. When the ants foraged cactus the tasks division was associated to polymorphism. The largest ants cut cladode and the smaller ones transported the leaves fragments. It seems that different classes of foragers are recruited to perform specifics tasks according the profitability of ant colony. Rate changes between the different specialized foragers would give a plasticity to *A. robusta* to adjust the collective foraging behavior according the changes of the habitat and needs of society to improve their fitness. (FAPERJ/UENF).

3.2.32 *Camponotus atriceps* - CASE STUDY OF A SILENT AND "IMMORTAL" INVADER

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Ants are the most diverse group among social insects, with great organizational and adaptive capacity. They are able to colonize and use a wide diversity of habitats and resources, being able to nest and occupy the soils, litter and / or canopy of natural environments. Some species, however, appear to have great affinity with anthropic environments, forming their nests in the most unusual places within the residences. Its ease in occupying spaces by expanding its nests as a way to dominate resources can become a problem for colony, which due to isolation, increases inbreeding. This strategy has a high cost for the gene pool of the population, making it more vulnerable to natural events and to the attack of pathogens. Comparatively, inbreeding becomes more evident and more likely when we analyze invasive species such as *Camponotus atriceps*. This dominant species in the canopies adapted with great ease to anthropic areas, mainly urban constructions. However, this adaptation made it highly vulnerable from a genetic point of view. A queen who colonizes a particular house, puts thousands of eggs, produces young males and queens, and these mates inside the original nest to form new nests. Thus, they extend the domain of the species by the environment, remaining there for decades. This situation raises the question of what makes the ants able to resist for so long, in such a restricted environment, being genetically vulnerable? In an attempt to remedy this issue, we began the creation and follow-up of a colony of *C. atriceps* in the laboratory. We adopt ad libitum as methodology for general observations, snapshots and video recording to describe specific behavioral events. Associated with these methods, we counted and measured the individuals to describe the population's life data. Partial results showed specific colony temperatures favored by eggs, larvae and pupae. We recorded a dynamics of cleaning and care with the garbage where the ants fought and prevented the proliferation of microorganisms like fungi and bacteria from them. The colony maintained annual reproductive cycle producing 5 males and 23 young queens. These individuals mated inside the nest. The founder of the colony died and was replaced. This cycle was repeated at least four times in the period of six months. As these behaviors explain the survival of genetically fragile populations in anthropic areas will be addressed in greater detail in the next stages of the project. (UFOP, LEEISDN, FAPEMIG)

3.2.33 WHAT CAN DIFFERENT HABITATS AND MONOCULTURES TELL US ABOUT THE BACTERIAL COMMUNITY OF *Atta sexdens* (Linnaeus, 1758)?

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Studies of bacterial communities can access the evolutionary significance of symbiotic interactions between hosts and their associated bacteria, as well as identify environmental factors that are capable of influencing host biology. *Atta sexdens* (Linnaeus, 1758) is a native species of Brazil that can act as a pest to some crops due to its intense behavior of cutting plants. Despite being extensively studied, there are still aspects regarding the general biology of this species that remain unclear, such as the evolutionary meaning of symbiotic relationships that it engages. Through Next Generation Sequencing and advanced computational techniques, this was the first study to compare the bacterial community of *A. sexdens* in their natural environments (Atlantic Forest and Cerrado - Brazilian Savannah) and main monocultures (agriculture) of São Paulo state (Brazil). Results revealed that the bacterial community associated with *A. sexdens* is stable, with no difference between samples collected in natural environments (Atlantic Forest, Cerrado - Brazilian Savannah) and those from non-natural habitats (sugar cane, eucalyptus, and citrus farms). Only the bacterial community associated with citrus presented a slight difference and is due to the presence of *Tsukamurella*, a bacterium widely used as a nematicide in citrus crops. Overall, we were able to verify that biome, diet, and localities did not explain the diversity of the bacterial community found in this leaf-cutting ant species. This suggests that leaf-cutting ants' native microbiota do not allow the establishment of novel bacteria acquired from distinct diets (distinct biomes), since this bacterial community is fundamental to the host and has been acquired over a long evolutionary timescale. Importantly, even significant recent modifications to the environment, such as monoculture, do not induce changes in the *A. sexdens* bacterial community. Studies that try to understand the mechanisms and processes that drive symbiotic diversity are important and may reveal important aspects regarding host biology. (Capes, Fundação Unesp, NSF)

3.2.34 DOES NUTRITIONAL SUPPLEMENTATION MODULATE THE DIVERSITY OF ANTS IN IRONSTONE OUTCROPS ENVIRONMENTS?

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Extrafloral nectars (NEFs) are characterized as a bottom-up defense element, where the attracted ants play a protective role of the plant against herbivory. One objective of this work is to evaluate if the maintenance of NEFs up to the mature leaves stage would increase the diversity of ants (richness and abundance). On the other hand, we know that adequate plant nutrition favors its growth and development, but we don't know how this supplementation affects the interaction with ants, so our second objective is to answer if the plant nutritional supplementation increases the diversity of ants. *Copaifera langsdorffii* (Fabaceae) is a very prominent deciduous plant, sprout in August and totally lose their leaves in May, as the plant's cycle is predictable, this is an excellent model to answer our questions. In order to do so, we selected 65 adult individuals of *C. langsdorffii* in the first phase of sprouting (August 2018) in an ironstone outcrops area in Serra da Moeda. We divided the selected plants into 5 treatments: i) 15 with nectar supplementation (tubes with 2ml of water and sugar); ii) 15 with application of foliar nutrients (amino acid biostimulants); iii) with the combination of treatments i and ii; iv) 15 without any type of treatment (control); v) 5 with tubes containing 2 ml of water. We applied the foliar nutrients and changed the tubes every 15 days, for nine months. In the pre-senescence phase of the following year's leaves (April 2019), we placed a pitfall (14cm diameter) with honey bait in each plant and left it for 48h, all the ants were later identified at the genus level. We tested if the richness and abundance of ants differed between treatments using a GLM followed by ANODEV. Richness and abundance were used as response variables and treatments as explanatory variables. The richness (Deviance = 68.33 F = 0.22 P = 0.92) and abundance (Deviance = 728.69 F = 0.15 P = 0.96) of ants did not vary between treatments. The continuous presence of the NEFs until the fall of leaves and the increasing of the nutritional quality of the plants wasn't a significant factor to increase the ants' diversity. One possible reason for the diversity variation absence in this work is the low diversity of ants described in Cangas. Therefore, nectar growth and nutritional supplementation were not a differential factor in the biotic protection of *C. langsdorffii* against herbivory. (CNPQ, UFMG, ECMVS)

3.2.35 DO SLOWER ANTS WIN THE RACE?

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Some important aspects regarding the removal of diaspores by ants still remain unanswered. Knowledge about the distances from the nests, the time of discovery and removal of resources by ants remain elusive. These factors influence the exposure time of diaspores in the environment, and may make them unfeasible due to predation and fungal infection. Thus, our aim was to evaluate the effect of distance from the nest on the discovery and speed of secondary removal of fleshy diaspores by ants. For this, we try to answer two questions: (1) what is the effect of nest distance on the time of discovery of diaspores? We hypothesized that nests closer to the resource will have shorter discovery times; and (2) what is the effect of nest distance on the speed of diaspores removal? We hypothesized that ants with closer nests will remove diaspores faster than the more distant nests. To answer these questions, we sampled 15 areas of cerrado *sensu stricto* (tropical savanna) and in each area we offered 50 artificial fleshy diaspores and observed them from 7:00 a.m. to 10:00 a.m. We found that: (1) the distance from the nest does not affect the discovery of diaspores. This contradicts our hypothesis, but our explanation is that ants are foraging all over the environment looking for resources, and regardless of the distance of the nests, the ones that find it first are more likely to remove it first. For (2), we have seen that there is a positive effect of the distance from the nest on the speed of removal, and the greater the distance, the greater the speed of removals, also being the opposite of our hypothesis. This probably occurred because larger ants, which removed more diaspores (eg *Ectatomma*), were observed in more distant nests. These ants have higher removal speeds, which may be due to their greater ease and strength to hold and remove the diaspores, and still they have larger areas of foraging, and consequently their nests can be found further away from the resources. Thus, large ants are shown to be beneficial for dispersal of diaspores, since the non-association between resource discovery and nest distances allows nest ants away from the resource to find and remove it, and more faster, which may decrease the diasporic exposure time to environmental variations and detrimental interactions. (FAPEMIG, CAPES, Cemig)

**3.2.36 NECTAR SEA OR DESERT OF INTERACTIONS:
INFLUENCE OF NICTEMERAL VARIATION IN THE
ACTIVITY OF EXTRAFLORAL NECTARIES OF
ABAREMA FILAMENTOSA (FABACEAE) IN THE
VISITING ANT COMMUNITY**

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“Restinga” is a coastal environment inserted in the Atlantic Forest biome and has particular features, such as high soil salinity and thermic amplitudes. In this environment, some plants has extrafloral nectaries (EFNs), structures mostly gland-shaped, which can be often found in vegetative tissues. They release a sugar-rich liquid as an important food resource to many ant species. Our goal was to test the assumption that the percentage of active EFNs in *Abarema filamentosa* is higher at night than at day and based on it, we have these explanatory mechanisms: (i) there is an increase of abundance and ant species richness in plants with the higher number of active EFNs; (ii) there are changes of ant species composition visiting the plants during day and night; and (iii) ants consuming extrafloral nectar are more aggressive when a higher percentage of active EFNs is available. We used 20 trees with a minimum 20 m distant each other. We selected a branch containing young and old leaves that were isolated with grease and ‘voil’ fabric. For each plant, we observed ten EFNs that remained isolated for 2 h in the hottest and coolest period of the day. After this time, active EFNs were counted. Ants were collected by beat technique during day and night, and identified to the lowest possible taxonomic level. For the aggression test, we used ten termites glued to leaves of each tree during ten minutes for recording ants behavior. Six species of foraging ants were found on plants: *Camponotus arboreus*, *Azteca* sp., *Brachymyrmex* sp., *Dolichoderus lutosus*, *Ectatomma tuberculatum*, and *Neoponera villosa*. Only *Brachymyrmex* sp. was recorded in both day and night time while others were collected only at night. We observed a higher number of EFNs active as well as a higher abundance and ant species richness during night time, which has the lowest recorded temperatures. Antagonistic ants behaviours were often performed at night and *Azteca* sp. was the main responsible for it. Ant species composition during day and night was also different with a special attention to *Azteca* sp. Thus, based on our results, we can conclude the availability of resources may structure the community of ant species that visit plants bearing EFNs. But, microclimatic conditions of the environment might also contribute to this. (UFES/CEUNES, LabSEI, SGV, CAPES)

3.2.37 IMPORTANCE OF CHEMICAL AND GEOGRAPHICAL DISTANCES IN DETERMINATION OF ANT'S AGGRESSIVE BEHAVIOR: FIRST INSIGHT IN THE *CECROPIA-AZTECA* SYSTEM

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Territorial animals tend to respond less aggressively to intrusions by neighbors than by outsiders, a difference in behavioral responses termed as “dear-enemy phenomenon”. In social insects, the identification of non-nest mates is mainly performed through “colony odors”, formed by hydrocarbon lipid compounds (CHCs) that cover the insects’ cuticle. The differences in the CHCs may be influenced by genetics, environment and/ or by the diet of colony individuals. Myrmecophytic ants present an aggressive behavior against plants’ natural enemies and, therefore, might be considered a promising model for studying nest-mate recognition and intraspecific aggressiveness. Thus, the present study aims to experimentally test the importance of geographical and chemical distances on the aggressive behavior among individuals of *Azteca muelleri* ants inhabiting *Cecropia glaziovii* plants. We sampled a total of 50 ant colonies in three Atlantic Forest fragments located in Viçosa, Minas Gerais, Brazil. After that, we performed aggression tests with the 50 colonies (25 nest pairs) belonging to our three sites. We observed the behaviors of ants in each aggression test scoring then from 0 to 5. Levels of 0-2 were considered non-aggressive behaviors, whereas levels 3-5 were considered aggressive behaviors. Then, we measure the geographical distance between each pair of nest submitted the aggression trials. Finally, for the same nest pairs, we identified concentration peaks of chemicals compounds (CHCs) and evaluated the concentrations of these components by chemical analysis. Our results showed a positive effect of geographical distance on ant aggressiveness ($F_{2,22}=8.9014$, $p=0.007$), and a significantly higher aggressiveness between pairs of ants from different site when compared to pairs of ants belonging to the same site ($F_{3,21}=9.498$; $p<0.001$). On the other hand, *A. muelleri* aggressiveness was not influenced by chemical cuticles profile ($F_{2,2}=0.0065$; $p=0.936$), and we also did not detect a significant interaction between geographical distance and chemical distance ($F_{4,20}=0.4161$; $p=0.526$). The *Azteca-Cecropia* system exemplifies a relationship in which the increase in geographic distance influences positively the aggressive behavior between ant nests, therefore following the dear-enemy phenomenon. However, in this system the total of principal chemical compounds does not explain this aggression behavior. Thus, it is necessary to further investigate if and how chemical cuticle compounds and others parameters such as genetic distance, influence aggressive behavior in plant-ants. (CAPES, FAPEMIG, CNPQ).

3.2.38 ANTS, BEES, AND WASPS HAVE THE SAME SPECIALIZATION DEGREE IN FLOWER-VISITING NETWORKS

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Insects that visit flowers are functionally important organisms in terrestrial communities due to their participation in plant pollination. However, because of environmental changes, their populations are threatened. The decline of half of the insect populations sets an alert and directs the attention to conservation strategies. For this, however, local studies on the diversity of plant-pollinator relationships are needed. Although scientists have been doing surveys of plant and flower visitors for a long time, knowledge is still limited. The aim of this work was to study the interactions among flower-visiting hymenopterans and plant species. The study was undertaken in the Botanical Garden of UFRJ, located in the municipality of Seropédica, Rio de Janeiro. The samplings were made during the day, fortnightly, from December 2018 to May 2019, in transects involving 67 listed and geo-referenced plant species. The criteria for defining those transects were the presence of flowers and hymenopteran visitors. In each plant species, flower-visiting hymenopterans were sampled for ten minutes. The collected insects were taken to the laboratory for identification. Connectance, nestedness, modularity, and specialization degree were analyzed for networks of ants, bees, and wasps found visiting flowers. The networks showed low connectance and nestedness; and modularity absence. Ants, bees, and wasps did not present different specialization degrees. *Camponotus crassus* and *Wasmannia auropunctata* were the species with highest interaction degrees. We also recorded *Cephalotes pusillus*, pollen and nectar consumer, and species of the genus *Crematogaster*, *Linepithema*, *Brachymyrmex*, *Tapinoma*, *Solenopsis* and *Pseudomyrmex*. *Apis mellifera*, *Trigona spinipes* and *Plebeia sp.*, relevant species for pollination and apiculture, were also recorded. Therefore, a considerable number of hymenopteran species was recorded visiting flowers in the studied area. Our results suggest that ants, bees, and wasps may have equal importance in the network structure of the local visiting-flower hymenopterans. By promoting plant species conservation, the botanical gardens can be also considered an important strategy for the conservation of a significant parcel of the insect fauna, as well as the ecosystem services they provide. (PROGRAMA PROVERDE-UFRJ).

3.2.39 ARE THE KEYSTONE INDIVIDUALS THE ACHILLES' HEEL OF *Acromyrmex subterraneus* COLONIES?

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In ant colonies different task response thresholds lead to a non-homogeneous distribution of the labor within workers. Some workers, called keystone individuals, perform a determinate task a number of times greater than the others. These individuals are highly influential for interfering with the activity level of nestmates. Thus, although promoting great benefits, keystone individuals can become points of susceptibility of the colony and then be considered the Achilles' heel, whose absence or error can put in risk the colony's success. Using leaf transport as model, we investigated how *Acromyrmex subterraneus* workers with a high level of leaf transport activity influence (i) the degree of activity of the less active workers and (ii) the colony's foraging efficiency. Also, we verified if the task response threshold of keystone workers is short term persistent. By individually marking workers from five colonies, we registered the frequency of leaf disc transport, enabling a classification of the workers in Activity categories: Hyperspecialists (H), Specialists (S), Non-Specialists (NS) and Non-Transporters (NT). Then we manipulated the presence and absence of the keystone individuals (H and S), simulating five social environments. Before any manipulation, we verified that leaf delivery rate ($LDR = \text{Burden} / \text{Travel Time}$) was similar for H, S and NT. However, when keystone individuals were absent, the LDR of NS workers increased and NT workers engaged in this task. After keystone individuals were restored in the colony, they showed lower LDR than before the manipulation and than from NS workers. On the other hand, when considering the efficiency of activity category (number of trips by category x Burden) / average Travel Time), we registered higher efficiency for H and S workers before manipulation, but their efficiency was lower after being restored to the colony. Inversely, the efficiency of NS workers increased when H and S were absent and remained high even after H and S had been restored. After being restored to the colony, S workers had a higher tendency to become NS and NT, meaning that they reduced their activity. On the other hand, H workers presented similar tendency to shift to any category, meaning that just 25% of initial H workers remained working at higher level. Thus, keystone individuals were not the Achilles' heel of the colony, since the supply of leaves was maintained through their replacement by other workers, those who were Non-Specialists became more efficient, and Non-Transporters engaged at the task (UFJF, CAPES).

3.2.40 PROTECTION AGAINST HERBIVORY BY ANTS IN EXTRAFLORAL NECTARY OF *Inga edulis* (FABACEAE) IN AN ANTHROPIC AREA

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Many plant species have extrafloral nectary (EFNs), which are a source of nutrients that attract ants and can protect the plant against herbivores. Behavioral differences among ants can alter the ecological consequences of plant-herbivore interaction. Mainly in anthropic areas and at presence of invasive species. The aim of this work was to inventory the ant fauna associated with the extrafloral nectary of *Inga edulis* (Fabaceae) in an anthropic area and to check the anti-herbivory protection service. The study was carried out around the Universidade Federal do Sul e Sudeste do Pará, between 7:00h to 10:00h and 19:00h to 22:00h. The richness and abundance of ants visiting EFNs was observed and the damage of herbivory per plant was estimated. A total of 1281 ants distributed in 4 subfamilies and 7 species were sampled, the Myrmecinae family being the most frequent (89%). The invasive ant specie *Solenopsis invicta* was the most representative (88%) followed by morphospecies *Camponotus* sp1 (7%) and *Dolichoderinae* sp1 and *Pseudomyrmecinae* sp1 (2%, each), *Paratrechina* sp1 (1%) and *Crematogaster* sp1 (0.1%). In relation to the morning and night period: 7 species (morning) and 2 (night) were identified, with a similarity of 30% between the periods. *S. invicta* and *Camponotus* sp1 were the most frequent morphospecies independent of the period of day (88% and 7.26%, respectively). We found that older plants (larger diameter of the stem at ground level) increase the diversity of ants. Probably older plants have a higher production of nectar, thus supporting a greater diversity of ants. However, we did find effect for ant's abundance, where probably some behavioral factor related to the first ant species that visit the EFNs influence the other species. The plants with the lowest herbivory damage were those with the closest nests. We noticed that the all nests closest to *I. edulis* belongs to *S. invicta*. We conclude that *S. invicta* is reducing the damage of herbivory, in other words, the closer to the nest of the plant the faster the anti-herbivory defense response. *S. invicta* presents aggressive behavior, associated to the proximity of its nests, demonstrating territorial defense behavior. The ant-plant interaction provides benefits to the visiting EFNs ants, in exchange *I. edulis* receives protection against herbivores. However, there is concern about the presence of an invasive ant that can reduce the diversity visiting EFN ants or reduce the frequency of native species, as demonstrated to *Camponotus* sp1. (UNIFESSPA, PROEX)

3.2.41 ANTS (HYMENOPTERA: FORMICIDAE) NESTING OF DECONGPOSTING STOOLS IN CERRADO OF MARANHÃO, BRAZIL

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The complexity of plant formations in the Cerrado (Brazilian savanna) offers wide availability of nesting sites for ants. In spite of this, studies on trunk nesting ants in Brazil are still not very substantial, being limited to Amazon and Atlantic Forest regions. The present work aimed to know the diversity of nesting ants of trunks decomposing in the Cerrado environment. The study was carried out in the Área de Proteção Ambiental do Inhamum, Caxias - MA, with data collected between August / 2018 and May / 2019. For the selection of the trunks the following criteria were used: fallen and unbranched trunks; which had a circumference between 20 and 60cm and between 60 and 200cm in length. The characteristics of the trunks were verified as to the degree of decomposition or rigidity, according to the following classification: Type I - in the initial stage of decomposition; Type II - intermediate stage and Type III - advanced stage. The classification of the ants was based on the location where they were observed in the trunks (center and shell) and in the presence (ants nesting) or absence (ants visitors) of nests. A total of 120 trunks were analyzed, which has an average of 33.50 cm in diameter and 103.09 cm in length. Of this total, 67 trunks were classified as Type II, 40 Type III and 13 Type I. 58 species of ants were identified, distributed in 23 genera and seven subfamilies. Regarding the presence or absence of nests, 36 of the species of ants collected had nests, 22 were only visitors and 19 were observed as nests and visitors. *Camponotus atriceps*, *Pseudoponera gilbert*, *Hypoponera* sp.1 and *Gnamptogenys striatula* were the species verified with the highest number of nests in the different verified trunks, all of which belong to genera recognized by the potential of nesting variety. Regarding the location of the nests, 20 species were verified by nesting the center of the trunks; nine in the center as well as in the bark and only seven species nesting only in the bark. The greater presence of nests in the center of the trunks is due to the greater space for nesting and an eventual protection against predators or climatic factors, like rains. This work is configured as the first study on decomposing trunk nesting ants for the Cerrado biome, providing unprecedented information on the diversity and biology of this ant guild. (UEMA).

3.2.42 DOES FIRE AFFECT THE SEED REMOVAL BY ANTS IN CERRADO?

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Ants have a great biomass, number of individuals and ecological impact in the Brazilian Cerrado. Several studies of ant-diaspores interactions in cerrado have emphasized the role of ants as predators and dispersers of seeds. Like any savanna, Cerrado is subject to natural occurrence of fires. It is believed that fire, soil nutrient availability and climate are the main drivers of Cerrado vegetation dynamics. However, the interplay between fire, seed dispersal and predation by animals, particularly for Cerrado, is quite unknown. Since interactions between animals and plants commonly affect the abundance, diversity, capacity of colonization and regeneration of plants, it is appropriate to investigate how fire affects these interactions. The present study aims to test if fire affects the seed removal by ants, considering the rates and distances of seed removal and the species of ants involved. This study was conducted in an area of Cerrado, in the Santa Bárbara Ecological Station, in southeastern Brazil. We sampled plots for two treatments (burned and control), and in two distinct moments (before and after fire). The post fire data were collected approximately one month after its passage. For each plot, we collected data for the amount and distances of seed removal and ant species. We recorded at least 30 species of ants of eight genera in interactions with seeds in both treatments. The most important genera seems to be *Pheidole* (Myrmicinae) with 69% of the interactions recorded, followed by *Ectatomma* (Ectatomminae) with 13%. Preliminary results indicated that there was no difference in seed removal before (59%) and after (50%) fire. Removal distances were greater before (mean \pm SD = 78.6 \pm 64.6cm) than after (53.4 \pm 69.5cm) fire. Fire did not affect the species richness either, as 16 and 18 species were sampled before and after the fire, respectively. Overall, fire does not seem to change the general structure of seed removal by ants, at least on a short time frame. The use of fire as a management tool for conservation purposes has increased in many savannas of the world. Our results suggest that fire is not substantially changing ant-seed interactions in our savanna, and thus fire can be used as a management tool without compromising seed dispersal by ants. (UFSCar, PPGERN, CAPES)

3.2.43 FORAGING ECOLOGY OF *ATTA SEXDENS* IN AN RIPARIAN FOREST CONVERTED TO PASTURE

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The leaf-cutting ants (LCA) are considered the main herbivore in the Neotropical and are one organism that benefits in landscapes modified by humans. Changes in the composition of plant species caused by human disturbance within the foraging area of LCA may lead to changes in the investment of the recruitment for food and its herbivory. The aim of this work was to verify the effect of the conversion of natural areas to pasture in the ecology of the foraging of *Atta sexdens* in areas of tropical rain forest. Field research was conducted close to Tauari River, Marabá-PA, in areas of pasture and riparian forest. For each nest we observed for 5 minutes after establishment of the trunk trail: (i) ant flow, (ii) amount of ants going to foraging, (iii) amount of ants carrying fragments (iv) amount of ants returning without fragments and (v) leaf consumption in area and biomass (cm² and g). The ant flow was 2.5 times greater in the pasture area (313.4 ants / 5 min \pm 72.11, mean and standard deviation) than in the riparian forest. The same occurred for the number of ants going to foraging (123.8 ants / 5 min \pm 67.44) and ants carrying leaf fragments (132 ants / 5 min \pm 66.7) being 4 times greater than in the riparian forest area. We found similar results for the number of ants returning without fragments (71.07 ants / 5 min \pm 57.86). In relation to leaf consumption only in terms of biomass differed between environments. With the highest biomass consumption for the nests in pasture area (2.2g \pm 1.14), being 2.4 times greater than in the riparian forest area. Basically an ant of a nest that is established in pasture area carries on average 0.04g while an ant in riparian forest 0.02g. We found that the conversion of natural areas to pasture caused changes in the LCA foraging effort. Probably, due the scarcity of tree species in pasture areas forces *A. sexdens* to compensate by increase the recruitment to obtain the amount of vegetation needed to sustain the fungus garden. This result is consistent with the optimal foraging theory. In other words, only a small fraction of material transported to nests in pasture areas is consumed in comparison to resources available in the riparian forests areas. These results reinforce the notion that human disturbance affect many aspects of the LCA foraging ecology. (UNIFESSPA, CNPq)

3.2.44 VEGETATION COMPLEXITY INFLUENCE TROPHIC GUILD STRUCTURE OF ANTS IN TROPICAL RAIN FORESTS: ANTS AS INDICATORS OF ENVIRONMENTAL CHANGE

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The environmental balance can be measured by observing the population characteristics of groups of specific organisms, considered bioindicators, and the degree of change or complexity of an environment. One of the most important bioindicators are the ants because they are a diverse group in species and by the easily of sampling. The objective of this work was to analyze the effect of vegetation parameters on ant guilds and to infer about the environmental quality. The study was developed in the Tapirapé-Adquiri National Forest - FLONATA (5°35' and 6°00' S and 50°24' and 51°06' W) an integral protection conservation unit in the tropical rain forest biome. We used the ALL protocol for ant sampling. We selected five vegetative parameters: (1) LAI (leaf area index); (2) LALe (effective leaf area index); (3) Vegetation cover; (4) Crown porosity and (5) Clumping index. In total 1935 ants were collected. The subfamilies with the highest species richness were Myrmicinae (22), Ponerinae (8), Formicinae (5), Dolichoderinae, Ectatomminie (3 species each) and Dorilynae (1). We recorded 7 trophic guilds, with the highest frequency being generalist omnivores (65.38%), ground-dwelling omnivores (8.68%), ground-dwelling generalist predators (8.37%), ground-dwelling specialist predators, arboreal omnivores (7.49%), cryptobiotic attines (2.27%), and raid-hunting predators (0.26%). We did not find any effect of the vegetation complexity for richness and abundance of guilds. Indeed, no large variation was found between the parameters, possibly FLONATA reached the climax stage. In order to understand the community of the trophic guild, the parameters LALe (74%) and LAI (65%) present the greatest effects on community structuring. According to ecological requirements the species *Cryptomyrmex* sp1 (0.20%, frequency), *Lachnomyrmex* sp1 (0.25%) and *Mycerotositis* sp1 and sp2 (0.05% and 0.62%) are indicative of preserved forest environments. In relation to guilds, the cryptobiotic attines and raid-hunting predators are also bioindicators of areas preserved for being more sensitive to environmental variations. The high occurrence of the guild of the generalist omnivores confirms their potential as bioindicators of preserved environments and ecologically stabilized, since they were the most frequent, the occurrence of this guild can be explained by its generalist food habit, therefore, its population density is totally dependent on the availability of potential resources. In this way, we conclude that FLONATA is a forest of high environmental quality and that it finds in ecological balance. Thus, the study provides subsidies for the use of trophic guilds as bioindicators in areas of tropical rain forest (UNIFESSPA, FUNTEC).

3.2.45 DIVERSITY AND COMPOSITION OF ANT COMMUNITIES IN A REFORESTATION AREA OF *Bertholletia excelsa*

3.2.46 (LECYTHIDACEAE)

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The environmental degradation caused by human activities has caused serious consequences in tropical rain forests, in which they directly affect the vegetal composition of the area. In this context of fragmented landscapes dominated by a community of few plants species and with reduced populations of animals, it has taken the attention of society for the recovery of these areas. The aim of this work is the use of ants in the monitoring of an area of forest restoration with plantations of Brazil-nuts (*Bertholletia excelsa*). The study was carried out in an area of forest restoration (2 years of abandonment) with predominance of *Bertholletia excelsa* and we used as a control area the National Reserve of Tapirapé-aquiri (FLONATA). Data collection was performed using the Winkler extractors on the ALL protocol. A total of 1125 ants were sampled (reforestation and control areas), distributed in 6 subfamilies and 35 species, Myrmicinae showed higher richness (18), Ponerinae (6), Formicinae (4), Dolichoderinae and Ectatomminie (3 species each) and Pseudomyrmecinae one species. *Dolichoderus* sp1 is the most frequent species (10.48%). In the reforestation area, 119 ants were sampled, distributed in 4 subfamilies (absence of Pseudomyrmecinae and Ectatomminae) and 8 species. The most abundant subfamily was Mirmecinae (5 species). The most frequent species were *Strumigenys* sp1 (17.64%) and *Solenopsis* sp1, sp2 and sp4 (5.04%, each). The results showed that the species richness present in the reforestation area was 2 times smaller than FLONATA. The same pattern for abundance, however with a greater amplitude, FLONATA showed an abundance 8 times greater than the reforestation area. We found a low similarity (10%) of species between the areas. Due to the recent removal of vegetation we sampled only ants that forage on the ground. However, a good indication for reforestation area is the presence of *Strumigenys* sp1 that indicates areas with abundance of litter. This may indicate an advance in reforestation. However, the presence of *Solenopsis* species with high abundance is indicative of disturbed habitats, forest edges and agricultural environments, and may reduce ant diversity. We can observe that the reforestation area is at the beginning of the secondary succession and is still on the effects of the human disturbance. We suggest: (1) continuity of reforestation for plant enrichment of the area to advance in the restoration, (2) continuity of environmental monitoring using ants, and (3) verifying if ants are providing environmental services (e.g. seed dispersal). (UNIFESSPA, FUNTEC)

**3.2.47 THE INFLUENCE OF AFRICAN GRASS INVASION
(*Urochloa* sp.) ON THE REMOVAL OF SEEDS BY ANTS
IN CERRADO**

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Invasive plants threat biodiversity by modifying vegetation, soil properties, microclimate, fire regime and habitat complexity, which can alter animal species composition and ecological interactions. In Cerrado exotic African grasses such as *Brachiaria* (*Urochloa* spp.) were introduced for cattle grazing decades ago. These grasses became invasive and are replacing native plants. Changes in species composition can modify microhabitat complexity, shade, temperature and humidity conditions that influence the foraging behavior of ants. We do not know if these changes are influencing plant-animal interactions such as seed dispersal and predation that are important for vegetation dynamics. Our goal was to (1) test if *Brachiaria* changes microhabitat complexity; (2) investigate if the invasion changes seed removal. We performed removal experiments using seeds of *Aegiphila Ilhotzkiana*, *Myrsine umbellata*, *Erythroxylum cuneifolium*, *Alibertia edulis*, and *Brachiaria Urochloa* sp. in five distant sites of Cerrado in São Paulo. Seeds used in the experiments were set under a selective exclosure cage, allowing only access to ants. *Brachiaria* increased vegetation cover compared to the native grasses, therefore, providing a higher habitat complexity that may changes local species composition and ecological interactions. Nevertheless, different from what we expected, the presence of the invasive grass did not alter the amount of seed removal by ants. Removal differed among sites, with higher removal in the smaller and more disturbed sites. Seeds of *Alibertia edulis* and *Brachiaria* were more removed in the native grass than in invaded spots. The higher removal of seeds from *Brachiaria* in spots covered by native grasses suggest a potential biotic resistance against plant invasion, but probably insufficient to deter invasive spread. (CAPES)

3.2.48 AUTOMATED VIDEO TRACKING OF LEAFCUTTING ANTS BEHAVIOURAL RESPONSE TO REMOVAL OF DIFFERENT PROPORTIONS OF CASTE

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Several strategies compose the behavioural spectrum of foraging in leaf cutting ants. These strategies can be modified according to availability and quality of food, distribution of resources, nutritional status of the colony and other ecological influences. The presence of polymorphic castes in *Atta* genus, adds complexity to the system by optimizing colony foraging. We evaluated the foraging behaviour of early colonies (*Atta sexdens*) by automated video tracking taking into account changes in the generalist caste ratio (cephalic capsule between 1.4 and 2.2mm). The treatments performed were: T1: 100% of generalists; T2: 50% of generalists; T3: 10% of generalists. The behaviour of individuals in the foraging chamber was filmed with an EthoVision imaging system in each of treatment for 1 hour, in four blocks. Based on the variables generated by the Etho Vision program, and considering the cross validation method, and the mean square error of prediction, the most important variables selected were: mean velocity, mobility state, rest period, continuous mobility. By contrasting the treatments according to the Bayesian credibility intervals, it was verified that there is no evidence of significant difference between the treatments in relation to the variables average speed and continuous mobility. On the other hand, the state of mobility and rest period were significantly influenced by the treatments, with a positive linear relationship between these variables and the removal of proportion in the workers. In other words, the shortest accumulated durations for mobility period and resting period were found in treatment 1, whereas inverse results were found in treatment 3 and intermediate situation was found in treatment 2. The behavioural response of the colonies also will be analyzed after a week of the removal of caste proportions, these are therefore, partial results. (USP/Esalq, CAPES)

3.2.49 INTERANUAL VARIATION IN ANT SPECIES CONTRIBUTIONS TO SEED REMOVAL OF *XYLOPIA AROMATICA* IN CERRADO

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Ants can act as seed rescuers or secondary dispersers of non-myrmechochorous plants, potentially affecting seed fate and seedling distribution and survival. However, such ecological interactions probably vary greatly between years due to temporal fluctuations in ant species and resource abundance. Despite those fluctuations, seed removal rates can still be consistent because of functional compensation among species. However, removal distances and places of seed deposition vary with species identity. Thus, they are likely to change depending on relative species contribution to removal. Long-term studies are thus important to allow a broader view of seed removal dynamics and its potential consequences for plant regeneration. Here we assessed interannual variation of seed removal by ants in a Cerrado site in southeastern Brazil. We used seeds of *Xylopia aromatica*, a native species of Cerrado, and compared seed removal rates, distances of seed removal and seedling distribution in ant nests. We performed exclosure experiments in order to assess the contribution of ants to diaspore removal. We used arilate and cleaned seeds in removal experiments and attributed “seed dispersal” when arilate seeds were removed and “predation” when cleaned seeds were removed. We also recorded the ants attracted to the seeds, as well as measured removal distances and seedling numbers in ant nests and controls. We compared data from 2019 with data collected 15 years ago (2004/2005). As expected, seed removal rates did not differ between years. In both periods we found that ants probably dispersed more seeds than preyed on them. Ant genera that dominated seed removal were *Pheidole*, *Atta*, *Odontomachus* and *Pachycondyla* in both periods. However, interactions with *Pheidole* increased in 2019, while interactions with *Odontomachus*, *Atta* and *Pachycondyla* decreased. There were no differences in seed removal distances between periods but seedling distribution was slightly different. Seedlings were found near *Pheidole*’s nests in 2019, compared to none in 2004/2005. *Pheidole* ants behave mainly as granivores but some of the harvested seeds could be placed in viable conditions in refuse piles. Yet increases in interactions with these species could mean decreases in interactions with species considered to provide higher quality dispersal, such as *Odontomachus*, *Atta* and *Pachycondyla*. Even though removal rates were consistent between years, variation in the relative contribution of ant species to removal could have consequences for plant recruitment depending on which species contributes the most and what treatment seeds receive in the nest. (CAPES)

3.2.50 SPECIALIZATION, ELITISM, INACTIVITY AND AGE POLYETHISM IN YOUNG COLONIES OF *Acromyrmex subterraneus* Forel, 1911 (HYM., FORMICIDAE)

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In leaf-cutting ants (*Atta* and *Acromyrmex*) the complex social organization observed emerges especially from the division of labor among the workers, allowing the concomitant accomplishment of different tasks in a cooperative way. Age polyethism refers to the distribution of activities among individuals of similar ages who perform a common task, promoting worker specialization and/or inactivity. However, the scenario in young colonies turns out to be especially different, given the small population size, with all workers being more likely to perform all activities without distinction. In this context, the activity of the first generations of *Acromyrmex subterraneus* workers were evaluated. Queens collected after the nuptial flight were kept in the laboratory under controlled conditions and as the workers emerged, they were identified by color, each color being equivalent to the week of emergency. The colonies were observed after the offering of sheets, during the first 12 weeks of development, registering the frequency in which each age group performed the tasks of foraging, care with the fungus and care of the offspring. Through generalized models, it is observed that young workers are more likely to forage in less developed colonies than in more developed colonies and there is a reduction in the probability of foraging with increasing age. As for fungus and offspring care tasks, it is worth noting that there is a reversal of this prediction from weeks 8 and 9 of colony development, respectively. This indicates that older workers increase the frequency of execution of these activities in more developed colonies. The colony development promotes an increased demand for fungus care and since the population has also increased, the division of labor tends to become more homogeneously distributed among the workers. It is suggested that the first generations of workers exhibit low specialization, being at the beginning elite workers and probably becoming inactive in advance, since in mature colonies, with consequent higher population density, the foraging activity only begins after the third week of life. The investigation of age polyethism in the young colony reveals a different form of organization and allocation of tasks in leaf-cutting ants that ensures their development. (UFJF, CNPq)

3.2.51 FERN-ANT INTERACTIONS IN BRAZIL: WHAT DO WE KNOW SO FAR?

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Since ferns have no flowers, most researchers have long ignored the potential of fern-animal interactions. The main goal of this study was to present a summary of the interactions between ferns and ants observed and described by the research group entitled “Fern-insect interactions” in Brazil. The studies, involving eight fern species, were conducted in the Atlantic Forest of Rio de Janeiro and Pernambuco states (Brazil). Commensal, antagonistic and mutualistic interactions were recorded. [1] Commensal interactions: six ant species belonging to five genera (*Crematogaster*, *Camponotus*, *Procryptocerus*, *Tapinoma*, and *Wasmannia*) were recorded in senescent galls of *Microgramma squamulosa* (Kaulf.) de la Sota (Polypodiaceae); eight ant species from six genera (*Brachymyrmex*, *Camponotus*, *Crematogaster*, *Nylanderia*, *Pheidole*, and *Pseudomyrmex*) were found in the petioles of *Acrostichum danaeifolium* Langsd. & Fisch. (Pteridaceae), and one species of *Linepithema* was observed in the petioles of *Pteris deflexa* Link (Pteridaceae). The relationship between these ants and ferns seems to be a simple “host-guest” interaction. (2) Antagonistic interactions (predation): damage caused by *Atta cephalotes* (L.) was recorded in four fern species, namely, *Ctenitis distans* (Brack.) Ching (Dryopteridaceae), *Danaea geniculata* Raddi (Marattiaceae), *Meniscium macrophyllum* Kunze, and *Meniscium serratum* Cav. (Thelypteridaceae). The most severe damage was observed in *M. serratum*, in which 32.3% of the leaf area was removed by the ants. (3) Mutualistic interactions: 25 ant species were reported on the leaves and foliar nectaries of *Pteridium arachnoideum* (Kaulf.) Maxon (Dennstaedtiaceae), *Ectatomma tuberculatum* (Olivier) and a *Camponotus* morphotype being the most frequent and abundant species. The functions of the foliar nectaries of ferns and their relationship with ants remain poorly understood. *Atta cephalotes*, *Camponotus crassus* (Mayr), *Crematogaster curvispinosa* (Mayr), and *Wasmannia auropunctata* (Roger) ants interacted with two or more fern species. There is a significant gap in the inventories of ants associated with Brazilian ferns. Mutualistic interactions involving the presence of domatia and foliar nectaries should be further investigated in Brazil. For antagonistic interactions, the responses of ferns to the damage inflicted by ants, as well as the reasons for the attacks, will be the focus of future studies. (CNPq, FAPERJ, PROCENCIA-UERJ)

3.2.52 ACTIVITY OF *SESAMUM INDICUM* EXTRACTS ON *ATTA SEXDENS* COLONIES AND WORKERS

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The leaf-cutting ant *Atta sexdens* is a pest that reduces significantly production in eucalyptus and important agronomic crops. The main control tactic is chemical using baits formulated with the active ingredient – sulfluramid. However, it must be withdrawn from the market because its negative environmental impact. An alternative to chemical control is the use of plant extracts with low environmental toxicity. We evaluated the activity of methanolic extracts from sesame leaves (*Sesamum indicum*) on ant workers of *Atta sexdens* at concentrations – 50, 100 and 250 µg/mL. The extracts were applied topically on thorax dorsum of the worker ants isolated from their colonies. Another experiment was conducted to test the ingestion effect of plant extract solution (250 µg/mL) with the presence of ant symbiont fungi. For the ingestion bioassay, ten worker ants per pot (total of 10) were fed with a solution of sesame extract diluted in honey and water (1:2). From these ten pots (500 mL) five were confined with fungi colony and other five without fungus. Also, in five pots with larvae, pupae and 10 workers from a single ant colony were confined with approximately 2.0 g of fungi mass treated directly with a solution of methanolic extract. When the extract application was topical, no significant difference was observed. However, in the ingestion bioassay, significant differences at mortality were observed when the fungus was present. It suggested that fungus could reduce the toxic effect of the methanolic extract. In the bioassay where the methanolic extract was applied directly on fungi mass there was observed structure loss and reduction of 20% volume of fungi mass, as well as 50% workers mortality after 21 days of observations. In conclusion, the methodology for evaluation of plant extract activity on leaf-cutter ants must consider the importance in maintaining the insects with the symbiotic fungus after their contact with the solutions.

3.2.53 THE *ATTA SEXDENS* FUNGUS INCREASES A SURVIVAL OF WORKERS CONTAMINATED WITH VEGETABLE EXTRACTS

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The leaf-cutting ants are important pests in the forest and agricultural systems. Many individuals from the colony cut and carry fresh plants to the nest to rearing a symbiotic fungus. Alternatives tactics to chemical control, such as the use of plant extracts, have been searched to control those pests. We evaluated the effect of the applying topically extract of mentrasto (*Ageratum conyzoides* L.) and cassava (*Manihot esculenta* Crantz) and the contact with the symbiotic fungus *Leucoagaricus gongylophorus* on the survival of the workers of leaf-cutting ants *Atta sexdens* isolated from colonies. Ten medium workers were removed from their colonies and received the application of 1µL of the extract on the back of the thorax to the bioassay of topical application. The cassava extract with hexane of 125µg/ml was diluted in a solution of honey with water to the ingestion bioassay. Five repetitions of four colonies received a portion of the fungus symbiont and another five did not receive the fungus. Cassava at a concentration of 100µg/ml was the extract that promoted the significant death of the workers after four days. Surprisingly, the ingestion and contact fungus presented had lower mortality than the workers who were kept isolated ($\chi = 8.97$, gl = 1, $p < 0.01$). This result suggests that symbiosis between the ants and fungus is more than a food source for leaf-cutting ants, once it can reduce the toxic effects when the ants remain with fungus contact. (UFSJ, CNPq/ PIBIC).

3.2.54 SYMBIOTIC RELATION BETWEEN NEOTROPICAL SPECIES OF THE GENUS *STRUMIGENYS* FR. SMITH, 1860 (MYMICINAE, ATTINI): MUTUALISM OR PARASITISM?

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*Ant's colonies have symbiotic relations with many other living organisms whether animals or plants. There even exist relations between ants of different species or even genera that live together in the same nest. Most are well defined case of social parasitism. In the Atlantic Forest of Southeast of Bahia State (Brazil) we found a symbiotic relation involving three species of *Strumigenys* (Myrmicinae). The objective of this study was to start to understand the nature of this symbiosis by analysing data from colonies collection and from first observations in laboratory: (i) *Strumigenys schulzi* was encountered forming mixed colonies either with *Strumigenys subdentata* or *Strumigenys denticulata*; (ii) *S. schulzi* was never found nesting alone contrary to the two others; (iii) each species has one queen in the colony; (iv) there is no difference between the number of workers of *S. subdentata* in colonies alone and in mixed colonies that are composed of almost the same number of workers of the two species; (v) there is no difference between the number of workers of *S. denticulata* in colonies alone and in mixed colonies, however the largest number of workers of *S. denticulata* was found in mixed colonies; (vi) males were found in some mixed colonies of *S. schulzi* / *S. denticulata*; (vii) alate gynes of *S. schulzi* were found in some mixed colonies with *S. subdentata*; in laboratory: (viii) alate gynes of *S. denticulata* were produced in colonies of *S. denticulata* alone and in mixed colonies; (ix) males are produced in colonies of *S. denticulata* alone and in mixed colonies; in the mixed colonies: (x) there is production of immatures of the two species; (xi) the workers of the two species were observed foraging, hunting, participating in brood care, nest defence and nest relocation; (xii) no aggressive behaviour was observed between the members of the mixed colonies. The point (ii) indicate that *S. schulzi* is not independent from the two other species and the points (vi) and (vii) suggest that she could use each of the two species according to their working force to produce her reproductive castes. These points tilt the balance in favour of social parasitism, while most of the others challenge this conclusion. *Strumigenys schulzi* has a complementary morphology with the two other ones and this symbiosis, found in some Asian *Strumigenys* spp. too, could be an original case of synergy between species. Cooperation rather than competition in ants? (UNIVASF, Projeto de Integração do São Francisco - Ministério do Desenvolvimento Regional)*

3.2.55 EXTRAFLORAL NECTARS AND ANTS: EFFECTS ON STRUCTURE OF NETWORKS IN SPECIES OF MALPIGHIACEAE JUSS.

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Ecological networks have been widely used to describe mutualistic interactions. Mutualistic networks usually have a core composed of central species, that is, dominant, territorialist species with high recruitment rates that influence the structure of the entire network of interactions. Plants with extrafloral nectaries are presented as excellent models to describe the role of associated arthropods in the organization, structure and dynamics of mutualist interactions. Thus, we aimed to evaluate the arthropod community associated to nectariferous species through different metrics and to determine the relative importance of arthropod communities associated to plants. For this, we test the following hypotheses: (1) Species with EFNs have structurally similar networks and (2) The structure of the networks involving plants with EFNs present ants as core species. The field study was carried out in a cerrado *sensu stricto* area in the Área de Proteção Ambiental (APA) São José in the municipality of Tiradentes and the following species were used: *Banisteriopsis campestris* (n = 15), *Heteropterys umbellata* (n = 15) and *Peixotoa tomentosa* (n = 15). The arthropods were collected and later morphotyped up to the lowest possible taxonomic classification and organized into entomological collections. In order to evaluate the structure of the networks, three bipartite networks were constructed and the following metrics were used: modularity, complementary specialization, niche overlap and diversity of interactions. We determined which are the central species, evaluating those that presented frequency of interactions above the average of the network. 22 morphospecies were collected. Hymenoptera was the most common order (45%), followed by Araneae (27%) and Hemiptera (9%). The orders Coleoptera, Lepidoptera, Neuroptera and Thysanoptera together represented less than 20% of the collected species. The Malpighiaceae networks were structurally similar, with low specialization and high overlap of niches, indicating the presence of generalist species of insects that overlap in the use of the resource. The central species of the studied plants were composed exclusively or mostly by ants, corroborating the second hypothesis of this study, especially *Cephalotes pusillus*, present in the central nucleus of all the networks. This fact may be related to the importance and protective capacity of the ants in these species of plants that have EFNs. The present study showed that networks of sympatric plants with EFNs present generalist guilds and that ants are key elements in the structure and organization of these networks, playing an important ecological role in the diversity of ecosystem functions. (UFSJ)

3.2.56 DAILY ACTIVITY OF *Atta laevigata* (SMITH, 1758) IN *Eucalyptus* PLANTATION IN THE BIOMA CERRADO

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One of the most important activities of leaf cutting ants is foraging, which consists of selecting, cutting and transporting plant fragments to the nest. Therefore, the objective of our study was to quantify the variation in daily foraging activity of the workers of the species *Atta laevigata* in the Cerrado. The study was carried out in a plantation of *Eucalyptus urophylla* located in the municipality of Curvelo - MG. The plantation is approximately 4 year old and covers an area of 19.43 ha. Five colonies of *A. laevigata* were selected and the flow of foraging workers was monitored on one of the trails of each colony for 5 minutes, every hour, during 48 hours with a digital camera. The temperature and relative humidity at the nest entrance were recorded using a portable digital thermo-hygrometer (Skill-Tec SKPSD-01) after each recording session. Videorecording at night was performed with the use of a LED torch, with the glass covered by a red cellophane paper so as not to interfere with ant activity. The number of workers returning to the nest loaded (with a vegetation fragment) was counted on the videos. The highest activity of laden ants occurred in winter between 8:00 and 14:00 with two peaks at an average of 6.68 and 6.28 ants per minute (average value for the five nests). Unladen ants show the same pattern of activity. The activity of laden ants in summer was more regularly spread over 24 hours with an average flow varying between 3.82 and 8.40 ants per minute. The flow of laden ants was the lowest during spring with less than 4 ants per minute. In autumn the average flow of laden ants ranged from 1.72 to 8.82 ants per minute with a peak at 15:00. Moreover, foraging workers were active at all times of day from summer to winter whereas they were more nocturnal in spring. Support: CNPQ, FAPEMIG, VALLOUREC FLORESTAL, CAPES

3.2.57 NATURAL DISTURBANCE CAN INFLUENCE THE RECRUITMENT FOR FOOD BY *Solenopsis invicta*?

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The ants and others social insects present auto-organized society, which the individuals communicate to change information: improve the work division, resource utilization and defence actions. Changes on the nests organization and the recruitment's efficient can be caused for natural and anthropogenic disturbances. The aim of our study was investigated the effect of rain on the foraging activity of *Solenopsis invicta*, an invasive species and considered a pest in America. Five nests, with different size areas, of *S.invicta* was selected in anthropogenic area close to Universidade Federal do Sul e Sudeste do Pará - Campus III, Marabá - PA. In each nest we established tree stations to offer protein (10g of sardine): to 0 cm, 50 cm and 100 cm away from nest. The natural disturbance was simulated by rain event, where we considered rainier month of Marabá city and then we calculated the average daily precipitation, with this average we estimated the proportional rain for each nest area. We conducted the experiment during the night (19:00 to 22:00h) in two periods: one before and other after the rain event simulated, with a 24h interval. We considered recruitment the arrival time until the stations and the abundance during 30 minutes. To compare abundance and the time of arrived of the ants on the stations, area of each nest and the events pre and post rain, we used general linear mixed models (GLMM) with nest as random factor. The abundance was influenced for nest area and for the distance to station to the nest, being grater before the rain event. The time of arrived of the ants until to station did not differentiated and either was influenced by the simulated rain event. Larger nests with high individual's abundance recruit with more facilitate and then increase the possibilities to manipulate the resource. The time which the ants spend to recruit can be nest's answer per resource. The experiment was realized on the high activity period of *S. Invicta*, this can explain the time of arrived of the ants to baits regardless to natural disturbance event. This study assists to understand the behaviour dynamic of *S. invicta* and your spatial distribution after a rain event. (UNIFESSPA/IESB)

**3.2.58 DAILY RHYTHM IN BIOMASS ACCUMULATION BY
Atta laevigata (SMITH, 1858) IN EUCALYPTUS
PLANTATION IN THE CERRADO**

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Atta laevigata (Hymenoptera: Formicidae) has a great agricultural and forestry importance in the different regions of Brazil. This ant can forage up to hundreds of kilos of leaves per year, but the seasonal rhythm of foraging this species is unknown. The study was conducted in a *Eucalyptus urophylla* plantation with ages of approximately 4 years-old in the municipality of Curvelo-MG. Leaf fragments were collected on foraging trails with a forceps during two minutes every two hours, during a 24 hour. The material collected was dried in an oven at 60°C for 48 hours, or until the material acquired a constant mass. Each dry fragment was weighed on an analytical digital scale (0.0001 g), and its area was measured using the Free Software Image J (v 1.49). The highest amount of biomass collected varied between seasons, being more intense during the daytime period in winter, autumn, summer and nocturnal in the spring. It is concluded that there is variation in the daily rhythm of foraging of *Atta laevigata* between the seasons in Eucalyptus plantations in the Cerrado biome, with predominance in the morning and afternoon periods, unlike *Atta sexdens* that prefers forage in the night. Support: CNPQ, FAPEMIG, VALLOUREC FLORESTAL, CAPES

**3.2.59 DISPERSAL OF NON-MYRMECOCHORICAL
DIASPORES OF *Erythroxylum simonis* Plowman
(ERYTHROXYLACEA) IN FRAGMENT OF ATLANTIC
FOREST**

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Diplochory refers to a second diaspore dispersal event after the initial removal from the mother plant. Ants are considered important secondary seed dispersers, and the myrmecochoric plant species have evolved special adaptations to seed dispersal by ants. However, ants also can act on diaspores that have not evolved strategies to interact specifically with ants, the non-myrmecochorical diaspores. For both, ants provide seed dispersal services such as seed removal and/or seed cleaning which promotes seed germination, plant recruitment and establishment. The outcome of mutualistic interactions like seed dispersal can be modified by environmental conditions as edge effects, which follows habitat loss and fragmentation, compromising several ecosystemic functions. Here, we examined if edge effects affect the efficiency of seed dispersal services (seed removal and seed cleaning) provided by ants to a non-myrmecochorical plant species in an Atlantic Forest fragment. We placed 20 stations, 10 at the very edge of the fragment and 10 at the nucleus (at least 200m away from the nearest forest boundary), 50m away from the nearest station. In each station, we placed 10 fruits of *Erythroxylum simonis* Plowman 1986 on 3cm leaves caught from the litter. We observed stations from 7h – 12h and considered as dispersed the seeds moved away from the leaves they were on. After five hours, we collected all the stations (leaves, fruits and ants) to proceed ant morphospeciation and counted the seeds removed (dispersal rate) and visually quantified seed cleaning as the percentage of fruit surface (remaining fruits on the leaves) cleaned by the ants. We found 12 ant morphospecies on the stations (five on edge and seven on nucleus stations). Edge effects did not explain seed dispersal rate, but seed cleaning on nucleus stations were 8,3 times higher than seed cleaning on edge stations. Our results suggest that edge effects may change the efficiency of services related to seed ecology provided by the ants due to the reduction in the cleaning efficiency. The mechanism involved in this changes is likely related to changes in ant species composition between forest edge and nucleus. Bigger and mass recruiting ant species may be present over the whole forest while the small cryptic species, which have lower removal capacity but high cleaning capacity, may be less represented on edges. Such results may be important to understand the fate of non-myrmecochorical plant species in fragmented and edge affected environments. (FAPESQ, UFPB)

**3.2.60 DIVISION OF LABOR AND BEHAVIORAL
SPECIALIZATION AMONG WORKER SUB-CASTES OF
THE LEAF-CUTTER ANT *ACROMYRMEX*
*SUBTERRANEUS***

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Ant colonies may contain worker sub-castes whose behavior is mediated by an interplay of morphological and temporal attributes. In leaf-cutting ants, division of labor among worker sub-castes is crucial for well-organized performance of brood and fungus care, substrate foraging and processing. As such, tasks must be efficiently distributed among worker sub-castes in order to keep the symbiont fungus healthy. Therefore, the behavioral repertoire of workers and task execution are essential for colony maintenance in fungus-farming ants. Here we provide a qualitative and quantitative account of intracolony behavior in *Acromyrmex subterraneus*, a common leaf-cutting ant of the Brazilian Cerrado savanna. We used three queenright colonies to gather behavioral data of *A. subterraneus*. Morphological worker sub-castes were categorized by head width into minor (0.9 - 1.1 mm), media (1.2 - 1.6 mm) and major workers (1.7 - 2.0 mm). Seven hours of qualitative observations provided the list of behavioral acts and categories, and quantitative ethograms were taken in intermittent 1-hour sessions, totaling 7 hours of observation per sub-caste per colony. Ethograms showed that performance of major behavioral categories (e.g., “Brood and Queen Care”, “Foraging”, “Fungus Care”) and the composition of behavioral repertoires distinguish labor among worker sub-castes in *A. subterraneus*. The behavioral patterns of media and major sub-castes are similar to one another, whereas minor workers form an isolated behavioral group. Minors were more involved in brood and fungus-related tasks, whereas media and majors were engaged mostly in foraging activities. Grooming was frequent in all sub-castes. In general, the behavioral patterns observed here for *A. subterraneus* are similar to other leaf-cutters. The tasks performed by the three sub-castes of *A. subterraneus* resemble the division of labor reported for *Atta* colonies, indicating that together with the use of fresh plant matter for fungiculture, a highly conserved set of intracolony behaviors persist since the origin of leaf-cutting. Our work emphasizes the importance of using diverse approaches in behavioral studies of polymorphic leaf-cutting ants in order to understand how task performance by worker sub-castes mediate colony organization, and how evolution might have shaped it. (UNICAMP, CAPES, CNPq, FAPESP)

3.2.61 INTER-RELATION BETWEEN SYMBIOTIC FUNGUS GROWTH, NUTRITIONAL VALUE OF PLANT AND SUBSTRATE SELECTION OF PLANTS

3.2.62 BY *Atta sexdens* (HYMENOPTERA: FORMICIDAE)

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The leaf cutter ants are able to cutting a large diversity of plants. Although they are polyphagous, these insects select the plants that serve as substrate for the maintenance of the symbiotic fungus. The factors that determine this selection are still unclear. This study aims to elucidate if the plant species preference of *Atta sexdens* is a consequence of chemical responses of the symbiotic fungus to the nutritional characteristic of the substrate incorporated. Leaves of *Acalypha wilkesiana*, *Gallesia integrifolia*, *Ligustrum japonicum*, *Ricinus communis*, *Rosa alba* and *Syzygium cumini* were used as plant resources in the experiments. The spontaneous preference of worker ants by some plants species was determined by comparing the number of leaf fragments of each species transported inside the nest. The growth of the symbiotic fungus was evaluated in culture media artificial increased with aqueous extracts of leaves of each plant species. The nutritional quality of the leaves of different species was determined by physico-chemical analyzes. It was determined the humidity, minerals, lipids, proteins and carbohydrates content. Excepting *S. cumini*, that was not much foraged by workers, the amount of carbohydrates was positively associated with number of leaves transported by the ants and with the growth of the fungus garden. The lowest growth of the fungus in artificial media occurred when was used extract of *R. communis* or *G. integrifolia*. The foraging of specific resources by ants appear as a consequence of interactions between symbiotic fungi and worker ants and not as an exclusive response of ants to stimuli of the plants. (FAPERJ/UENF)

3.2.63 SHOULD I STAY OR SHOULD I GO? INFLUENCE OF CHEMICAL CUES IN DECISION MAKING OF ANTS

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Animals can assess a handful of information from chemical cues left in the environment. However, the role of these cues in the foraging process has been little studied. Ants use chemotactic signals to identify and search for prey, optimizing their foraging success, and consequently the colony's fitness. These chemical cues are small hydrocarbon droplets, left involuntarily, which derive from the arolium, a pre-tarsal structure covered by a thin layer of liquid which generates a binding force when the insect walks, leaving a chemical trail where it passes. Studies regarding the effect of these signals are important to understand their role on the interactions between co-occurring species. We studied the importance of chemical cues of footprints on decision-making of ants, testing whether they followed footprints of conspecifics and other species, or preferred free areas. We used three species: *Odontomachus bauri*, *Pachycondyla* sp, and *Cephalotes* sp. Sixty foragers were collected from ten colonies of each species, in Dourados, MS, where all species co-occurred. The chemical traces of footprints of each species were obtained by placing 20 workers to walk for 10 minutes on a filter paper placed in a Petri dish. Then the filter paper was placed in one arm of a Y-maze, whose other arm was free of chemical marks. To assess whether foragers followed footprints of other species, or preferred free signaling areas, we assessed the decision-making of 60 workers of a species against the footprints of the 2 other species. We also evaluated the behavioral response of ants in relation to nestmates footprints. *O. bauri* and *Pachycondyla* sp. followed footprints of other species, which might be a form of espionage, i.e., they intercepted the chemical signals to gain access to food resources of other species. *Cephalotes* sp. avoided footprints of other species possibly to avoid physical confrontation, which can be very harmful to a smaller ant compared to the other species studied. All 3 species followed nestmates footprints, which is consistent with the fact that ants use their nestmates footprints as an indication of their homing site. All species followed footprints of conspecifics from different colonies, that because individuals from the same species have similar eating habits, thus following their chemical cues can be highly beneficial to a forager. Our results show that ant species detect and respond to chemical footprints, and these represent an ecologically important suggestion that ants use for their movement decisions.(UFGD, CAPES, CNPq)

3.2.64 PREDATION PROFILE OF THREE SPECIES OF THE GENUS *ECITON* (HYMENOPTERA: FORMICIDAE): SPECIALIST OR GENERALISTS?

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Army ants of the genus *Eciton* are important neotropical predators. Hundreds of species are directly or indirectly associated with them. However, most ants of the genus *Eciton* prey only on other social insects, including other species of ants. Little is known about whether the different species of *Eciton* specialize in the predation of particular ant species. Here we tested this by comparing the species raided by three species of *Eciton* with the local ant abundance and diversity. The research was carried out in Bragança, Pará, Brazil, in three fragments of primary forests. Each sample consisted in the collection of all the army ants carrying prey along the raiding column for 30 minutes. The ants were classified into subfamilies. Twenty-three sample points were collected, 8 of *E. mexicanum*, 4 of *E. rapax* and 11 of *E. hamatum*. Also, at 22 locations in one of the areas, we sampled the diversity and local abundance of ant species using one terrestrial and one arboreal pitfall trap. The points were 50 meters apart. *E. hamatum* (n = 11) preyed upon the subfamilies dolichoderinae, ponerinae, and myrmicinae, the latter being significantly more present. *E. mexicanum* (n = 8) preyed upon the subfamilies ectatomminae, formicinae, myrmicinae, and ponerinae, with no significant differences between the subfamilies. *E. rapax* (n = 4) preyed upon dolichoderinae, formicinae, paraponerinae, and ponerinae, with no significant differences between subfamilies. Comparing between species (n = 23), *E. rapax* preyed significantly more upon ponerine than *E. hamatum* which preyed significantly more upon myrmicinae than *E. mexicanum*. Only *E. hamatum* had prey items which correlated with local abundance. The most common subfamilies in the pitfalls traps were, myrmicinae (61%), formicinae (19%) and ponerinae (14%), respectively. Our results show that some species of army ants such as *E. hamatum* and *E. rapax* may be specialist upon some subfamilies or be more general predators, such as *E. mexicanum*, in which there were no significant differences in predation. However, if we consider the stage of development of prey, *E. mexicanum* catches more adults than any other army ant species in this research. The predation of most common ants may represent an important *E. hamatum* adaptation because increasing the likelihood of finding food resources. These specializations can be a result of competition between predators by trophic resources, and also result of predator-prey coevolution. These results can increase our knowledge about the interaction between army ants and the preyed ants. (Bolsa PQ (311790/2017-8), CAPES PROEX Psicologia Experimental (1964/2016), PROCAD Amazônia 2018 – Linha 1)

3.2.65 PREY CACHING ALLOWS MULTIPLE PREY ITEMS TO BE CARRIED SIMULTANEOUSLY IN *ECITON HAMATUM*: DESCRIPTION OF A NEW FORAGING BEHAVIOR

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Optimal foraging theory predicts that the costs associated with foraging should be minimal. In social species such as ants, collective strategies such as trail laying allow to optimize foraging efficiency. In army ants, two common collective strategies are used during foraging: the mass attack, in which thousands of workers attack at the same time with the power to overcome prey with low energetic costs, and team transportation, in which two or more workers cooperate in transporting large items. In *Eciton hamatum*, we observed two other previously undescribed behaviors linked to foraging. We call them the “Multiple Prey Transportation” and “Prey caching”. 11 raids of *E. hamatum* were recorded, and during each one, the ants carrying prey were collected for 30 minutes. 147 preys were collected and 125 could be identified. 10 foragers of *E. hamatum* were collected individually to record the mean number of prey per transport and a cache was collected to characterize the species at this location. 82% of the prey of *E. hamatum* were 5 species of myrmicinae, 4 species of the genus *Pheidole* and a species of the genus *Strumigenys*, all with workers less than 3.5 mm in total body size. The maximum number of prey per worker was 3, and the minimum was 1, with half of the workers collected carrying 2 prey items, with more than 2 mm each. 3 caches were observed, where several workers left their prey, which other collected using the first pair of legs before coming back to the nest. The behavior of carrying two or more prey items speeds up the foraging process and lowers the cost due to travel time. Moreover, this behavior is permitted by the existence of caches which allow prey manipulation away from the potentially dangerous predation site. This is to our knowledge the first record of task partitioning in army ants and this behavior, which is common in leafcutting ants, may represent an important adaptation for *E. hamatum*, which is able to prey upon ants that are very abundant in the neotropics in a more economical way, thus reducing the costs of foraging. (Bolsa PQ (311790/2017-8), CAPES PROEX Psicologia Experimental (1964/2016), PROCAD Amazônia 2018 – Linha 1)

3.2.66 GASTER LICKING PLAYS AN IMPORTANT ROLE IN THE MAINTENANCE OF REPRODUCTIVE STATUS IN THE QUEENLESS ANT *DINOPONERA GIGANTEA* (HYMENOPTERA: FORMICIDAE: PONERINAE)

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Queenless ants establish reproductive hierarchies where the highest ranking ant reproduces. Ranking in the hierarchy is established through aggressive and ritualised interactions between nestmates. In *Dinoponera gigantea* this process is poorly understood. The objective of this study was to understand the behaviors involved in the establishment of the reproductive hierarchy in this species. In laboratory, we observed 4 colonies (55.25 ± 6.42 individuals/colony) for 5 consecutive days, in 3 sessions of 1h per day, totalling 60 h of observations. The behaviors of antennal boxing, gaster curling, gaster rubbing, biting, blocking and immobilization described in the literature as related to the reproductive hierarchy in similar species, were recorded. Licking and gaster licking (characterized by licking and rubbing a nestmate gaster with the first pair of legs) were also recorded. A matrix of interactions was established for each colony and hierarchy was investigated considering the ants that performed together 90% of the aggressive behaviours observed. All ants included in the hierarchy, 5 ants that participated in interactions (but were not included in the hierarchy) and 5 inactive ants were dissected to check the spermathecae and the development of the ovaries to determine fertility and the presence of the gamergate. During the observations, 2251 behaviors were recorded. The most frequent behavior was gaster licking (26,52%), followed by licking (25,10%), antennal boxing (17,50%), bite (16,04%), gaster curling (12,04%), gaster rubbing (2,62%). Few immobilizations occurred (0.18%) and the blocking did not occur. The number of aggressive behaviors decreased during the observations, with 34% of all aggressive behaviors occurring on the first day of observation and only 7.29% on the last day. In all colonies, 12, 18, 5 and 7 ants, respectively, participated in the establishment of the hierarchy. After dissections, we verified the presence of a gamergate in all the colonies. Gaster licking was performed more frequently by the ants that were highly fertile (with five or six developed oocytes) than those that were not fertile. Our data showed that the gaster licking behavior performed by the fertile workers may be important for maintenance of their reproductive status within the hierarchy. However, more studies are needed to understand the potential role of this ritualized behavior in the establishment and modulation maintenance of the reproductive hierarchy in this queenless ant. (Bolsa PQ (311790/2017-8), CAPES PROEX Psicologia Experimental (1964/2016), PROCAD Amazônia 2018 – Linha 1)

**3.2.67 EFFECT OF NEST REFUSE THE LEAF-CUTTING ANT
*ACROMYRMEX BALZANI***

3.2.68 ON THE FITNESS OF *TURNERA SUBULATA*

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Leaf-cutting ants accelerate plant regeneration in disturbed environments through accumulation of nutrients in soil, especially by the process of substrate disposal (nest refuse or just NR). In such environments, nutritional limitation of the soil can affect the fitness (development and reproduction) of pioneer plants, which play an essential role in the natural regeneration of these environments after disturbances. In this study, it was investigated the effect of the organic substrate produced by *Acromyrmex balzani* (Hymenoptera, Formicidae) on the fitness of the pioneer species *Turnera subulata* (Turneraceae). It was hypothesized that NR contributes with better fitness attributes in *T. subulata* plants. To evaluate the effect of *A. balzani* NR on the fitness of the plant, seeds of *T. subulata* were seeded in a polystyrene tray with two treatments: control soil (Control) (soil + washed sand (3: 1)) and soil with nest refuse (Control + substrate (3: 1)). On the 30th day of sowing, seedlings were transplanted to 1L pots with both control (n=50) and NR (n=50) treatments. Variables as plant height, stem diameter and biomass were analysed, as development parameters and number of flowers, flower buds and seed production as reproductive parameters. All parameter analyses were performed after 120 days after seedling transplant. In addition, it was measured the total chlorophyll rate in all plants. Plants that grown in soil with substrate of *A. balzani* showed higher averages than control treatment in all biological attributes evaluated ($p < 0.05$). Additionally, it was verified higher chlorophyll content in plants maintained in the NR treatment ($p < 0.05$). As all these variables can potentially accelerate plant regeneration in disturbed areas and indirectly establish other ecological interactions, soil with NR can act as a facilitator in the process of ecological regeneration as it increases plant fitness. (PPG em Ecologia - UFS, COPES, CAPES).

3.2.69 INVESTIGATIONS OF ANT NEST ON SOIL FERTILITY AND PLANT DEVELOPMENT: A SCIENTIOMETRIC APPROACH

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Ants comprise one of the major group of animals associated to soil bioturbation that hence affect vegetation patterns. Experimental studies of the effect of ants on soil and plants result in a large amount of information about different aspects of this process, emphasizing their role as ecological engineers. The habit of digging soil for formation and maintenance of the colonies discards a large amount of fertile soil especially because of the organic residues that are generated, making it accessible to plants and thus modulating important ecosystem services. Although studies do not show a clear relationship between such services and their benefits to society, as observed by bee pollination, for example, soil ants are among the most studied insects. In this study, using scientometric techniques, it was analyzed qualitatively the trends and gaps of ant effect on soil and plants. Besides, it was built a network of the researchers around the earth that deal with this theme of investigation. For this, it was used both bibliographic material available in two previous meta-analytical studies and searches from CAPES platform, compiling 119 articles, ranging from 1970 to 2018. It was observed an exponential growth in the number of publications mainly in international journals, however with a low citation index. It was evidenced from network analysis that collaboration among researchers is compartmentalized in four groups formed by researchers of the most diverse continents. Also, it was observed that studies of the effects of nest on soil and plants are well-diversified in relation to co-authors. Specifically in Brazil, these investigations are concentrated in three different regions: north, south and northeast. However, these studies shown a weak connection. Whereas the effects of ants on soil and plants are a key element of ecosystem functioning, potentially interacting with all trophic levels, it is necessary the development of researches in order to fill the remain gaps in this theme. Therefore, it is suggested an increasing of collaborations among researchers for providing urgent advances, notably, related to the direct applications and the benefits to other areas such as agriculture, restoration and reforestation (PPG em Ecologia - UFS, COPES, CAPES).

3.2.70 RECURRENCE ANALYSIS OF ANT ACTIVITY BEHAVIOR IN DIFFERENT DENSITIES

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The phenomenon of periodic oscillations in animal activity has been observed in ants of the genera *Leptothorax* and *Temnothorax*, which exhibit periodic pulses of short-term activity at the colony level. Although isolated individuals and small groups of workers of these species do not show periodic oscillations, when their density increases, the predictability of dynamic activity becomes increasingly apparent. Although these results are intriguing, they have never been observed in other ant genera, nor has the transition to periodicity been studied in detail. Here, we used together the recurrence quantification analysis (RQA) and recurrence plots (RPs) to compare and analyze the activity dynamics of ant species with different levels of social complexity (e.g. colony size, behavioral and genetic composition, and the way in which

reproduction is partitioned among nestmates) and at different densities (1, 4 and 16 individuals). RQA and RPs are powerful nonlinear data analysis methods that quantify the number and duration of the phase space trajectory of the dynamical system over time, resulting in a detailed description of its behavior, including the quantification of dynamic patterns ranging from stochastic to deterministic signals. RPs and RQA has been used to interpret and correlate complex patterns in dynamic systems, such as in physics, physiology, meteorology, economics, geophysics and cardiology. The use of the RQA measures could give a more detailed and qualitative approach to time series analysis of complex dynamics. Three species of ants were used in our study: *Gnamptogenys striatula* (Ectatomminae), *Linepithema micans* (Dolichoderinae), *Pheidole rudigenis* (Myrmicinae), as well as adults of a gregarious beetle species (*Tenebrio molitor*) for comparison. Our data resulted in 150 time series of two hours each (300 hours). The results show that *G. striatula* and *L. micans* had similar dynamics, while *P. rudigenis* diverged more. Differently than the other ant species, *P. rudigenis* (minor and major workers) showed a peak of activity determinism within a density of four individuals, not sixteen, suggesting an optimal density for behavioral synchronization. In general, the differences between the activity dynamics of the species are more pronounced at higher densities compared to those of isolated individuals. Some ant species and also beetles exhibit characteristic short-term periodic activity pulses in small groups of individuals, suggesting evidence that such phenomena could be a by-product of the contact rate between individuals rather than an innate phenomenon of ant societies, not only present at the colony level (CNPq).

3.2.71 DOES THE MINING WASTE CONCENTRATION FROM BARRAGEM DO FUNDÃO INTERFERES WITH *Bauhinia rufa* LEAF SELECTION BY *Acromyrmex subterraneus*?

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The disruption of the mine tailings dam in Mariana-MG brought socioeconomic and environmental damage to the macro and microregion, with reforestation as a mitigating action for soil and biodiversity recovery. One of the main obstacles for reforestation is the presence of leaf-cutting ants, since they cut fresh leaves for the cultivation of their symbiotic fungus. Using an accurate chemical perception, foragers select leaves from the same plant species and even from the same individual. Such selection is based on the nutrient and toxin variation of the leaves, both obtained from the chemical composition of the soil. Thus, it is possible to assume that the concentration of tailings in the soil from this accident has an effect on the selection of leaves by leaf-cutting ants, this could lead to failure in the reforestation program. In this context, it was evaluated whether the concentration of tailings in the soil interferes with the process of selection of leaf discs of *Bauhinia rufa* (native leguminous used in reforestation program) by *Acromyrmex subterraneus*. For this purpose, plants were grown in soil pots containing different concentrations of mining waste (0, 25, 50, 75 and 100%), from which leaves were collected and 10 leaf discs were made, labeled according to each concentration and randomly offered in a foraging arena. Using a bridge, this arena was connected to a laboratory colony and the number of disks transported from each category to the complete loading of one of the treatments was recorded (5 replicates / 10 colonies). In order to consider the novelty effect, the process was repeated after 30 days. It was observed that plant discs grown in soil with 100% of tailings were significantly more loaded both in the first contact of the workers and after 30 days of the initial contact, however there was an increase in the probability of loading of the discs with lower concentrations of tailings, indicating that there was a reduction in preference. The preference for leaves with high concentration of tailings becomes an aggravating factor for the reforestation in the most affected places by the rupture of the dam (PPGCBA, UFJF, CAPES).

3.2.72 TIME-SINCE FIRE EFFECTS ON *COMPOSITION* OF EXTRAFLORAL NECTARIES VISITING ANTS IN SOUTH BRAZILIAN GRASSLANDS

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Grasslands are dynamic ecosystems strongly associated with disturbances, as fire and grazing. Grassland fires directly affects habitat openness and the assembly of plant communities, reducing biomass of dominant grasses, and allowing a diversity of low-competitive plant species (*e.g.* forbs, sub-shrubs) to establish and grow. This modifies habitat structure and resource availability for animal communities, including ants, that have strong interactions with plants. Thus, here we investigated whether grasslands with different time-since the last fire lead to changes in composition of ants visiting extrafloral nectaries (EFN) regarding their abundances. We selected 11 natural grassland patches at South Brazilian Grasslands along a gradient of time-since-fire categories: freshly (6 months); intermediated (1 year), and old-burnt (at least 2 years after fire). At each patch we sampled EFN-visiting ants in 10 individuals of an EFN-bearing plant (*Chamaecrista repens*). The species composition of EFN-visiting ants was analyzed with abundance data *per* ant specie at which *C. repens* individual using a Bray-curtis dissimilarity index. We recorded 21 ant species, from 9 genera and 3 subfamilies. The most abundant ant species were *Crematogaster* sp. 8 (117 individuals, 25% of interaction frequency), followed by *Camponotus punctulatus* (91 individuals, 37% of interaction frequency) and *Camponotus personatus* (78 individuals, 25% of interaction frequency). Nevertheless, *Camponotus punctulatus* were not sampled at old-burnt patches. The ANOSIM test shows that the species composition of EFN-visiting ants was clearly different between freshly and old-burnt but did not differ from intermediated grasslands. This result suggest that different ant species groups were favored/disfavored across the post-fire successional gradient, probably based on their potential preferences/tolerances to habitat openness and their associated abiotic variables. Ant composition patterns could be also varying due to alleviation/intensification of competitive interactions triggered by the habitat type. Here, the interactions of *Camponotus* and *Crematogaster* species with *C. repens* were clearly benefited in more recently burned patches. Therefore, since the ant composition changes according to the time-since fire, it is important to maintain mosaics with different time-since fire in order to conserve a greater number of species and to maintain the diversity of ant species in these environments under disturbance. (UFRGS).

3.2.73 PLANT FITNESS EFFECTS OF AN ASYMMETRICAL ANT-BEETLE-PLANT INTERACTION

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Nectarivorous ants are known for their effectivity in deterring herbivores, favoring plants with extrafloral nectaries (EFNs). Ant protection may have a positive effect on the plant fruit set, by preying, chasing or removing herbivores, including that on reproductive structures. In some cases, ants are ineffective against herbivores. Such events occur, for instance, when herbivores are endophagous (like floral ones), effectively hiding from ants, or even present adaptations to avoid ant attack. In a particular scenario on Cerrado, plants with EFNs of the *Banisteriopsis* (Malphigiaceae) genus attract ants, and are infested by endophytic larvae of *Anthonomus* beetles (Curculionidae: Coleoptera) that grow and feed on flower buds. We investigated (i) the florivorous weevil impact on the reproductive success of *Banisteriopsis*; and (ii) if ant visitation on EFNs provide an effective biotic defense against *Anthonomus* beetles. We conducted field experiments with ants and weevils being excluded. Two groups of 30 plant individuals were selected for each *Banisteriopsis* species: *B. malifolia* and *B. laevifolia*. Three similar inflorescences were selected in each plant and treated as: (I) control branch, with no manipulations, (II) beetle-free branch, isolated with voil and (III) ant-free branch, isolated at the base with atoxic wax (tanglefoot). We observed a total of 585 ants of ten species patrolling *B. Malifolia*, and 381 ants of six species on *B. laevifolia*. *Camponotus blandus* was the most common ant species. In both plant species, the beetle-free treatment presented a greater fruit set production when compared to the other treatments. The control and ant-free treatment did not diverge from each other, with respect to the number of infested floral buds. Results show that florivorous weevils have a negative impact on *Banisteriopsis*, and ants were ineffective to reduce such impact. The ants fail to protect the plants can be explained by curculionid adaptations. The larvae are protected inside the floral buds, hidden from the ants, while the adults show sclerotized bodies, immune to ant attacks. This study indicates the conditionality of the ant-plant mutualism and their effects on the plants fitness, where herbivore strategies overcome the ants defence. (CNPq, FFCLRP/USP).

3.2.74 DO WORKERS FROM SUBSPECIES *ACROMYRMEX SUBTERRANEUS* PREPARE LEAVES AND TOXIC BAITS IN SIMILAR WAYS FOR THEIR FUNGUS GARDEN?

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Toxic baits are the most efficient method to control leaf-cutter ants in eucalyptus forests for paper and cellulose production. For the proper use of these baits, insecticide compounds must reach workers and contaminate them. Thus, understanding how these baits are processed inside the nests is vital for a successful control, especially when it comes to genus *Acromyrmex*. Lack of information on toxic baits and on contamination of *Acromyrmex* workers raises the question: Do workers from subspecies *Acromyrmex subterraneus* prepare leaves and toxic baits in similar ways for their fungus garden? To answer it, this study described and analyzed the behavioral repertoire executed by *Acromyrmex subterraneus* workers during the preparation of leaf disks and baits and their incorporation into the fungus garden. Results show that the act of licking the substrate was the most frequently executed behavior, regardless of subspecies or size categories. Moreover, additional behaviors have been observed when workers processed the baits, such as licking and scraping their jaws on the surface of the bait pellet, as well as licking and biting fragments of bait pellets, moistening them. Thus, it is concluded that the preparation of baits is different from that of leaves; baits are more processed and can therefore contribute to contaminating workers via insecticides. (CAPES, CNPQ)

3.2.75 POLYGyny, OVIPOSITION, LIFE CYCLE AND LONGEVITY OF THE THREE SUBSPECIES OF LEAF-CUTTING ANTS, *ACROMYRMEX SUBTERRANEUS* (HYMENOPTERA: FORMICIDAE)

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Research related to comparative biology of phylogenetically-close ant species have received little attention, although it is the basis for understanding the systematics of some sibling groups. The objective was to study the polygyny, oviposition, life cycle and longevity of the three subspecies of leaf-cutting. For that, we studied: oviposition rate, queens from three colonies were individually placed in plastic containers, and at 24-hour intervals, the laid eggs were quantified over a period of 96 hours; the workers' life cycle was studied, the development of immature ants was observed every 24 hours and, as a result, the duration of each stage of development was determined; the workers' longevity was studied, newly-emerged adults were tagged and returned to the fungus chamber of their respective nests, and daily observations were made in each of the nest's chamber. Laying rates were quite variable in the three queen studied, with a mean of total eggs laid of 271 for *A. s. brunneus*, 113 for *A. s. subterraneus* and 119 for *A. s. molestans*. The incubation period was 21.2 days in *A. s. brunneus*, 22.8 days in *A. s. subterraneus* and 20.4 days in *A. s. molestans*. The larval phase and pupal phase lasted on average 22.5 and 21.2 days in *A. s. brunneus*, 22.8 and 15.8 in *A. s. subterraneus* and 17.2 and 14.2 days in *A. s. molestans*, respectively. Life cycle was different in the studied taxa, from 62 to 77 days in *A. s. brunneus*, 59 to 68 days in *A. s. subterraneus* and from 51 to 55 days in *A. s. molestans*. The workers' longevity varied between subspecies *A. s. brunneus*, *A. s. subterraneus* and *A. s. molestans*. (CAPES, CNPQ)

3.2.76 BIOMASS AND LEAF AREA ACCUMULATED BY *Atta laevigata* (SMITH, 1858) IN EUCALYPTUS IN THE CERRADO

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The leaf-cutting ants are considered dominant herbivores in the Neotropical region and pests in agricultural and forestry systems. *Atta laevigata* is the second more widely distributed species in Brazil and, even so, there is limited knowledge about those ants foraging patterns in forest plantations. The objective of this work was to estimate the biomass and leaf area foraged by *A. laevigata* in a eucalyptus plantations in the Brazilian Cerrado. The study was carried out in areas cultivated with *Eucalyptus urophylla* with 4 years-old in the municipality of Curvelo - MG. The fragments were collected in five colonies with a forceps for two minutes every two hours, during a 24 hour cycle, and put in a paper bags. The collected material was dried in oven at 60°C for 48 hours. Each dry fragment was weighed on an analytical digital scale (0.0001 g), scanned on a flatbed scanner (HP Photosmart C4200 series) at a resolution of 300 dots per inch to measure the leaf area using the Free Software ImageJ (v.1.49). The data were converted to square meters of loose soil from the nest due to variation in size of leaf-cutting ants. The mass data ($\text{g.m}^2.\text{day}^{-1}$) and leaf area ($\text{cm}^2.\text{sm.spa.day}^{-1}$) daily forage per square meter of loose soil of each nest were submitted to the Shapiro-Wilk normality test. To test the effect of the season on the significant factors we used analysis of variance (ANOVA) and then the Tukey test (5%). The forage leaf mass per square meter of loose soil per day of *A. laevigata* didn't differ between seasons, with values in winter, autumn, spring and summer of 1.102, 0.630, 0.898 and 1.322 $\text{g.m}^2.\text{day}^{-1}$, respectively. The foraged area also didn't differ between seasons, with a pattern similar to that vegetal mass of forage in winter, autumn, spring and summer with 89.63, 52.92, 78.71 and 95.29 $\text{cm}^2.\text{m}^2.\text{dia}^{-1}$, respectively. There was no difference in the accumulation of biomass and forage leaf area for this species between seasons, but we can consider that this ant can accumulate a significant amount compared to other species of leaf-cutting ants. Supporters: CNPQ, FAPEMIG, VALLOUREC FLORESTAL, CAPES

3.2.77 UNVEILING THE DIVERSITY OF ANT-HEMIPTERAN-PLANT INTERACTIONS FROM THE FORESTS OF ‘MACIÇO DE BATURITÉ’ IN CEARÁ, BRAZIL

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For almost 100 years, interactions between ants and plants bearing extrafloral nectaries and between ants and hemipterans exsuding honeydew have been studied all around the world. We currently know that most of these interactions are mutualistic, with ants gaining food in exchange for protecting plants and hemipterans. But such pattern is challenged by new studies on poorly sampled biomes. Specifically, in Brazil, there is a great diversity of ant-hemipteran-plant interactions, but these interactions are underestimated for northeastern biomes. To increase the knowledge about ant-hemipteran-plant interactions in Brazil, especially for the Atlantic and Caatinga Forest, we perform an inventory in the Ceará state. We sampled the interaction in the geological formation known as ‘Maciço de Baturité’ around Baturité city located in the north region of the Ceará, a study gap for Brazilian myrmecology, with more than 30.000ha covered by Caatinga and Atlantic Forest. We sampled six preserved sites of forest closed to cities of Acarape, Redenção, Piroás, Guaramiranga, Pacoti and Pernambuco, all sites separated 5-50km, circumscribing the Maciço de Baturité ranging from 200 to 1050m of elevation. At each site, we searched for the interactions in an area of 100m², and counted every interaction among ants, plants and hemipterans, identifying the species involved. We used the ant-plant and ant-hemipteran paired interactions to build networks and describe the patterns of interactions. As results, we registered 1520 ants from 32 species, being 1176 ants from 24 species interacting with 100 shrubs of 9 species of plants, and 344 ants from 13 species interacting with 45 aggregation of 16 species of hemipterans. Plants had more interactions than hemipterans and the ant species interacting with hemipterans were a subset of the ants interacting with plants. Network of interactions between ants and plants had a nested structure with *Senna georgica* (39 shrubs performing 50 interactions) and *Capparis flexuosa* interacting with half of the ants, with *Camponotus crassus* and *C. arboreus* dominating 50% of the shrubs of 7 plant species. Ant-hemipteran network had a centralized structure with three *Aphis* species attracting 70% of the ants and *C. crassus* e *C. arboreus* dominating 50% of the aggregations from 15 hemipterans species. With this, we described for the first time the ant-hemipteran-plant interactions for the Maciço de Baturité in Ceará and contribute to better understanding of the spatial variation of ant interactions showing new evidence to stablish ecological patterns for these interactions in Brazil. (UNILAB, CNPq)

3.2.78 HIERARCHY OF INTERACTION DOMINANCE IN ANT-PLANT MUTUALISM: A NETWORK APPROACH

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Interactions between ants and plants bearing extrafloral nectaries (EFNs) are mutualistic relationships based in offer of nectar in exchange of protection. Nectar consumption increases the fitness of the ant, which often compete for this resource, presenting aggressive behaviors and territoriality. Thus, interspecific dominance towards nectar may regulate the access to the plants and therefore, the frequency of ant-plant interactions. This study aimed to evaluate the dominance relationship between ants visiting EFN-bearing plants testing the hypothesis that ant-plant interactions are structured based in a dominance hierarchy. We also investigate the effect of the nectar quantity and quality as mechanism structuring those hierarchies. We performed the study in an area of Rocky Montane Savannah (Brazil) at a natural park near Ouro Preto (PEIT/IEF) using a long-term (8years) studied assemblage of ants interacting with plants. In this system, we evaluated the network of interactions between 32 ant species and 10 plant species for 2 years (2011-2013) to evaluate the structure of the interaction network and identify the most interactive ants. Then, we applied a behavioral experiment performing paired encounters between the ten most interactive ant species, replicated 10 times for each pair (100 in total). These were replicated for each of the 10 plant species (1000 in total). We quantify all behaviors, aggressive or passive, in each encounter, and use network approach to determine the hierarchy. We found a structured dominance hierarchy between ants competing for nectar in all plant species. *Camponotus crassus* were the most aggressive, attacking more frequently than been attacked, and there were also subdominant ants that attack and was attacked in similar frequency, and submissive ants that did not attack other ants. The degree of aggressiveness, the hierarchy structure and the dominant identity varied between plant species (context-dependence). Hierarchies of ants in plants providing high-sugar nectar were more verticalized and centralized compared to those in low-sugar nectar, although many species coexisted due to spatial and temporal variation in nectar secretion. We confirmed that the higher the position of the ant in the hierarchy, the higher its number of interactions with plants, and its access to nectar. We conclude that the dynamic relationships of dominance and the partitioning of interactions may be important mechanisms of ant coexistence in highly diverse mutualisms. (CAPES, CNPq, FAPEMIG)

3.2.79 GRASSLAND ANTS UNDER FIRE AND GRAZING: THE ROLE OF A NURSE PLANT ON ANT COMMUNITY STRUCTURE

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Ant community structure is highly dependent on habitat structure. Plants with complex structures play a key role in enhancing the heterogeneity of grassland habitats, especially those with morphological features related to reduction of cattle herbivory and fire protection. By such mechanisms, these plants are known to change plant community structure, but it remains unclear how they may influence higher trophic levels. The objective of this study was to evaluate the effect of *Eryngium horridum*, a thorny, rosette-like plant known to influence plant community structure, on the ant community under different types of disturbances in South Brazilian grasslands. We conducted an experiment designed in blocks, with each block (five in total) comprising three randomly allocated types of management (fire, grazing, and fire and grazing simultaneously). Within each block, pairs with different microhabitats were established: plots with *E. horridum*, and control plots without the plant. Ants were sampled with 3 pitfall traps in each plot and were identified to the genus level. Data were pooled in a community matrix with sampling units (30 in total; 3 management types and 2 microhabitats distributed in 5 blocks) described by mean abundance of ant genera. We estimated ant genus richness and diversity with Chao's and Simpson's indexes. We tested the influence of management and microhabitat on ant community composition, richness, and diversity with Two-way PERMANOVA, using Bray-Curtis' and Jaccard's indexes, to consider both species abundance and incidence. We found 1,731 ants distributed in 22 genera. *Pheidole*, *Solenopsis*, *Nylanderia*, *Brachymyrmex* and *Linepithema* were the dominant genera, summing up 74% of total abundance. Plots with *E. horridum* showed lower total ant abundance, as well as less individuals of *Pheidole*, *Brachymyrmex*, and *Linepithema*, in comparison with control plots. However, *Cephalotes*, *Ochetomyrmex*, and *Pseudomyrmex* were only found under *E. horridum*. Simultaneous fire and grazing were the management with higher ant abundance, and *Cephalotes* and *Pseudomyrmex* were found only under this management. Ant genus richness and diversity did not differ between management or microhabitat type. Grassland management determined incidence-based ant community composition, whereas the microhabitat influenced the abundance-based composition. Our results indicate that grassland management type and the microhabitat created by *E. horridum* influence the assembly of grassland ant communities, although playing different roles. Management seemed to determine which species were present at the communities, while the microhabitats determined their abundance relationships. (PUCRS, CNPq)

**3.2.80 ANT IS KNOWN BY THE COMPANY SHE KEEPS:
TWIGS SHARED BY ANTS (HYMENOPTERA:
FORMICIDAE)**

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The ecological success of organisms depends on biotic and abiotic factors. For social insects, nests play a central role in colony survival. Ants of different species occupy twigs in the leaf litter, and the study of ecology and behavior of these species is crucial to understanding their role in the environment. Aiming at the twigs as an ephemeral resource, we use a guild approach to verify if ant species sharing twigs have distinct food preferences in order to avoid territorial conflicts. The field expeditions were carried out between September 2010 and November 2015, in 22 areas of seven municipalities of the state of São Paulo (Brazil), in the Atlantic Domain. The transect was delineated using seven plots of 16 m² each, with a distance of 10 m, where all the twigs present in the leaf litter of each plot were collected and examined. In total, 153 twigs were occupied by more than one species of ant, being 77.8% by two species, 14.4% by three, 4.6% by four, 2.6% by five and finally 0.6% for seven species. The twigs had a medium size of 27mm in diameter and 76cm in length. We identified 83 species/morphospecies of ants, belonging to 26 genera and eight subfamilies. The richest genera were: *Pheidole* (18 species), *Solenopsis* and *Hypoponera* (eight species each). The species that shared the most frequent twigs were *Pheidole sarcina*, *Brachymyrmex admotus*, *Hypoponera* sp.12, and *Pheidole sigillata*. The species were classified into eight guilds. The generalist guild was more frequent and presented a greater resource sharing with the small-sized hypogaeic predators (98 times), and with other generalist species (71 times). The advantage of generalist species sharing twigs with small-sized hypogaeic predator species can confer mutual defense against invasors or predators in common through the use of distinct defense strategies. While the other species belonging to generalist guilds share resources, although in smaller numbers, with the other guilds suggests that these species are not potential prey and do not share the same food habit. The predator species (large-size epigaeic, medium-size epigaeic and specialized) presented a lower coexistence indicating a possible competition by resource. In the next steps we will deepen the study of the effect of biotic and abiotic variables to investigate the patterns of interactions between ant species that share the same resource and thus contribute to improving knowledge about the natural history of species that occupy twigs. (CAPES; CNPq; FAPESP)

**3.2.81 DIVERSITY OF FAUNA LIVING IN THE NESTS OF
Neoponera spp. AND *Pachycondyla crassinoda*
(FORMICIDAE: PONERINAE) IN AGROFORESTS OF
SOUTHERN BAHIA, BRAZIL**

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Nests of Ponerinae have weak structural organization; these ants show a great variety of nesting strategies. Consequently, these nests offer a range of microhabitats with favorable environmental conditions to associations with other organisms, as well vertebrates as invertebrates. The aim of this study was to evaluate the fauna diversity which lives as commensal in the nests of the Ponerinae ants *Neoponera* spp. and *Pachycondyla crassinoda*. The study was carried out from March to December 2017 in a cacao plantation of the cabruca type, Una municipality, in south of the state of Bahia, Brazil. The location of the ant nests occurred through visual inspection and sardine baits. The nesting substrates were extracted from their environment and placed in Berlese-Tüllgren funnels to sample the fauna that lives in. The invertebrates were compared between ant species and strata, thanks to similarity indices and multivariate analyzes. Twenty-four ant nests were collected, 21 nests of the genus *Neoponera* (*Neoponera curvinodis* [1], *Neoponera apicalis* [1], *Neoponera inversa* [3] e *Neoponera verenae* [16]) and three of *P. crassinoda*. In the understory, the nests of *Neoponera* were located in nodes of cacao trees and hollow parts of tree trunks. Ants in the epigeal stratum were located in dried cocoa pods, fallen trunks and bromeliads, both of which fell into the soil. All subterranean nests were of *P. crassinoda*, located in the superficial soil horizon. The invertebrates are living in the nests of the Ponerinae ants belonging to the following orders were recorded: Entomobryomorpha and Hymenoptera (18% each one), Diptera (11,4%), Hemiptera and Poduromorpha (6,9% each one), Coleoptera and Psocoptera (4,5% each one), in addition to representatives of Araneae, Acari, Gastropoda, Haplotaxida, Opiliones, Pseudoscorpiones and Scolopendromorpha (2,8% each one). The epigeal nests presented a higher number of morphospecies of associated invertebrates (42), followed by the hypogeal stratum (7) and understory (6). The nests of *N. verenae* were the ones that housed a greater number of commensals. Acari and Coleoptera were the taxa that had representatives on a greater variety of nesting substrate

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types and occurred in all strata. The nests of the studied species proved to be an optimal place to shelter a large variety of invertebrates in cocoa plantations. Therefore, this kind of agroforestry is an interesting form of agriculture which allows the conservation of a large diversity of invertebrates that present direct and indirect relationships with the ants. (CAPES)

**3.2.82 ATTA IN ATTACK: A STUDY ON THE INFLUENCE OF
WORKER POLYMORPHISM ON THE NESTMATE
RECOGNITION PROCESS OF LEAF-CUTTING ANTS**

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During the past 30 years, researchers have argued whether worker polymorphism has an influence on the nestmate recognition process of leaf-cutting ants. So far, two general but conflicting hypotheses have been raised in previous literature, (1) small-sized workers patrol foraging trails due to their small threshold response to alarm pheromone, and (2) small-sized workers are less sensitive to non-nestmate (NNM) odours due to brain miniaturization. In this work, we aimed to shed light on these hypotheses in a controlled behavioural experiment, using *Atta vollenweideri* as model species to quantify agonistic responses of morphological groups of workers when they were confronted with conspecific subjects in three different contexts: *i*) stimulated with alarm pheromone, *ii*) stimulated with territory-marking pheromone, and *iii*) when no alarm stimulus was applied (control). We hypothesised that the propensity to attack an enemy is higher for small-sized workers under alarm pheromone exposure, on the other hand, intermediate-sized workers (which are efficiently foragers) would show higher propensity to attack an enemy under territory-marking pheromone exposure. Our results show that exposure of test subjects to alarm pheromone or territory-marking pheromone did not increase the likelihood of attacking a NNM, nor any morphological group of workers were shown to be more efficient at attacking a NNM. Interestingly, when confronted with NNMs, small-sized workers showed a disproportionally large duration of mandible opening behaviour, which is the behaviour that characterise the alarm pheromone realising. These findings show evidence against the hypothesis which predicts that small-sized workers are less sensitive to non-nestmate odours and show evidence to support the hypothesis that integrate them as part of the defensive strategy of this species by predicting their role as patrolers of foraging trails. (USP, UK, CsF, CNPq, FAPESP)

3.2.83 PERSONALITY IN CASTES OF LEAF-CUTTER ANT, *ATTA SEXDENS* LINNAEUS 1758 (HYMENOPTERA: FORMICIDAE)

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In colonies of social insects, especially in species with morphological polytheism, it is expected that the behavioural differences resulting from specializations in tasks are correlated with morphological differences. Personality, defined as consistent behavioural differences across time and situations, has also been applied to insects. In order to test behaviour personality indicators of the ants *Atta sexdens*, popularly known as *saúva-limão*, boldness-shyness and exploration-avoidance were measured against chemical stimuli (waste and alarm pheromone). The sample was composed of Gardeners (activity in the fungus garden) and Waste workers (activity in the garbage), workers from two castes that perform activities in different areas of the nest. Two experimental tests, garbage and pheromone, were performed in two steps. Initially, each ant was placed in a glass arena for 60 s and then one of the two chemical stimuli was added for another 60 s separately. The ant behaviour exploring the arena and closer than 1 cm of distance to the stimulus were recorded with a video camera. Each one of the ants performed both tests (garbage and pheromone) three times, totalling 180 shots and GLMM was used for data analysis. Individuals from three colonies were tested, being five ants from each caste. Waste workers explored the arena longer than Gardeners in both of the tests, waste (Ww: 43.84 s; G: 33.23 s) and pheromone (Ww: 39.91 s; G: 32.08 s). Although some ants did not approach waste (Ww: 0.45%; G: 2.7%) or pheromone (Ww: 4.9%; G: 10.8%), Waste workers remained more time in average near the stimuli than Gardeners, waste (Ww: 42.01 s; G: 22.04 s) and pheromone (Ww: 13.15 s; G: 2.91 s). It was suggested that the behavioural differences between the castes is linked to personality traits, which could be one of the regulating factors responsible for the tasks in the nest. Bolder and explorative ants could take more risks (e.g., Waste workers) in comparison to those individuals related to protected environments (e.g., Gardeners), acting quickly in the face of risky situations and conferring, consequently, an adaptive advantage at the level of the colony. (CNPq, CAPES)

**3.2.84 THE INFLUENCE OF HABITAT EDGES ON
SECONDARY SEED DISPERSAL OF *MICONIA
RUBIGINOSA* IN A CERRADO**

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Diaspores deposited in the soil are often subject to secondary dispersal. Ants (Hymenoptera: Formicidae) are among the animals most likely to interact with fallen diaspores due to their large biomass and numerical dominance. Ants are important seed predators and dispersers in the Cerrado, a global biodiversity hotspot severely fragmented and affected by anthropic use. In the Cerrado, most plants produce non-myrmechochorous diaspores, but ants can influence the seed dispersal of those plants. However, the responses of these interactions to disturbances are poorly known. In this study, we evaluated whether the proximity to the edge of habitat fragment influences the secondary dispersal of *Miconia rubiginosa* by ants. *M. rubiginosa* is a bird-dispersed shrub that produces berries (ca. 0.11 g) in Cerrado. The study took place between January and March 2019 at Itirapina Experimental Station, in the center-east of São Paulo (22°12' S, 47°51' W). Eight parallel transects were marked, 4 in the edge (in a 10 m stripe of vegetation growing at the fragment border) and 4 in the interior of the fragment (> 30 m from the nearest edge). In each transect we marked 5 points distant 10 m from each other. At each point 2 fruits and 2 seeds of *Miconia rubiginosa* were placed and observed at 15 minute intervals for 2 hours. We recorded the ant-diaspore interactions and measured removal distances to the ant nests. Our data revealed that the interaction of ants with fruits and seeds was more frequent at the border than in the interior of the fragment, due to an apparent greater ant nest abundance at the edges. Therefore, ants could be more important drivers of seed fate and plant regeneration (either positive or negative) at edges. (PPGERN / UFSCar, CNPq)

3.2.85 THE EFFECT OF SEED MANIPULATION BY ANTS ON SEED FUNGI INFECTIONS: IS *ATTA SEXDENS* A BETTER CLEANER THAN *ACROMYRMEX SUBTERRANEUS*?

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Seed dispersal by ants – myrmecochory - is comprised of three main phases, namely seed removal; seed manipulation and seed deposition. Specifically, the processes of seed manipulation by ants, inside the nest, present controversial effects on seed germination that could be negative, neutral or positive depending on ant identify. A remarkable example of such contradictory outcomes is presented by two highly widespread leaf-cutter ants in Brazil. *Atta sexdens* is known to increase seed germination of *Mabea fistulifera* (a myrmecochorous tree) and *Acromyrmex subterraneus* to decrease this germination. However, the mechanisms involved in those findings are still elusive. Those two ant species are known to presents a different strategy to clean materials before taking them to their nest. Furthermore, fungi infection is a great cause of embryony mortality on seeds. Based on these statements, we aim to test the hypothesis that *A. sexdens* has a cleaning behavior more effective against fungi present on seeds than *A. subterraneus*. We used four mature colonies of each ant species kept in trays under laboratory conditions. We offered to each colony 20 seeds of *M. fistulifera* and at the same time we place, outside each colony tray, a Petri dish containing other 20 seeds from the same lot. Therefore, we had four treatments: i) seeds manipulated by *Atta*, ii) seeds placed outside *Atta* nests (*Atta* control), iii) seeds manipulated by *Acromyrmex* and iv) seeds placed outside *Acromyrmex* nests (*Acromyrmex* control). After 48 hours, we collect all the seeds that had been manipulated by ants and also the ones in the control groups (non-manipulated). Then, we superficially watched the seeds with sterilized water and placed each one in a Petri dish with culture media (PDA). We maintained the Petri dishes with seeds in a B.O.D. (25° C) for 15 days. Then, we identify the fungi present in each dish. We found a total of 26 fungi taxa. *A. subterraneus* presented a higher fungus richness when compared to the other three treatments, that did not differ among them. The fungi composition was also different among treatments. We demonstrate that fungi infection after ant manipulation might be an important mechanism influencing the contradictory results on the effect of *A. sexdens* (positive) and *A. subterraneus* (negative) on seed germination. This finding reinforces the recent idea that myrmecochory is not a diffuse mutualism and shows that differences on seed manipulation processes could also be considered as a factor response to it. (UFV, FAPEMIG, CNPq, CAPES)

3.2.86 TRADE-OFFS IN LOCOMOTION PERFORMANCE ACROSS ECOLOGICAL CONTEXTS: TURTLE ANT RUNNING SPEED IN THE CANOPY

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Evolutionary trade-offs in trait function constrain how organisms interact with their environment. The canopy environment is structurally complex, with foraging surfaces of a range of sizes and orientations, and often dominated by ants. Nevertheless, little is known about how ants use canopy structures as they forage, and what trade-offs they might experience. Turtle ants (*Cephalotes*) are a species-rich genus of canopy ants that have undergone exceptional morphological diversification. In particular, there is a five-fold difference in body length across species, which is likely to have important consequences for locomotion performance. This work examines performance trade-offs in turtle ants across a variety of ecological contexts that occur in the canopy. The focal species for this study were *Cephalotes atratus*, *Cephalotes borgmeieri*, *Cephalotes clypeatus*, *Cephalotes grandinosus*, and *Cephalotes pusillus*. The experiments were conducted in a cerrado area at Serra do Cipó, Brazil. Performance ability was measured by recording peak running speeds across wood dowels two widths (small, 5mm diameter, and large, 23mm), and two orientations (vertical and horizontal) across both widths. At least 20 ants running toward the food with one continuous run along a 5 cm section was recorded for each trial. The best continuous running time of each individual was used for analyses. *C. atratus* was the fastest species with the greatest variation in running speed (significantly different than all other pairwise comparisons). *C. borgmeieri* ran at a consistently slow speed across all paths (not statistically significant across all pairwise comparisons). When speeds were adjusted for body length, *C. pusillus* was the fastest species (significantly different than all other pairwise comparisons). *C. grandinosus* was also faster than other species, especially on the large dowel width (significantly different than all other pairwise comparisons). *C. atratus*, *C. borgmeieri*, and *C. clypeatus* were all consistently slow when adjusted for body length. *C. pusillus* and *C. clypeatus* both had slower speeds on vertical paths compared to horizontal paths (significantly different than all other pairwise comparisons). The faster species when adjusted for body length had more variation in running speed across paths and the slower species had more consistency. This indicated there may be a general body plan which allows species the same speed relative to size across *Cephalotes*. The species whom vary from this consistent speed may employ alternative foraging strategies creating a trade-off between consistency and speed. Broadly, this research contributes to understanding functional trade-offs between organismal structure and environment. (NSF)

3.2.87 SENSORY SPECIALIZATION, PREY SELECTION, AND COEXISTENCE IN ARMY ANTS

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Understanding of the mechanisms that promote coexistence of species-rich predator assemblages in the Neotropics is critical for explaining the structure of diverse tropical communities. New world army ants are voracious predators of ants and other arthropods throughout the Neotropics, and up to twenty species may co-occur in one location. They therefore offer a valuable opportunity to address how predators partition prey resources and coexist. While we know that each army ant species specializes on different ants, and in a few cases other arthropods, little is known about the mechanisms by which they locate, identify, and initiate attack of their preferred prey. In studying the closely related army ants *Eciton burchellii* and *E. hamatum*, we asked the following interconnected questions: 1) Do army ants prefer specific sources of prey-derived odors? 2) Do army ants detect vibrational cues from potential prey irrespective of identity? 3) Are *Eciton burchellii* army ants able to detect and attack preferred prey of their co-occurring congeners? We filmed and measured army ant behavioral responses to several categories of prey-derived cues to determine the degree to which army ants use odors and vibrations to detect food and direct foraging. We found army ants are specialized on odors derived from preferred ant prey, and ignore odors from non-prey ant species. Army ants also had varied responses to different sources of prey odors; prey nest material was most attractive, odors of live and dead prey were next most attractive, while alarm odors were of little interest. Additionally, we found that the two army ant species responded differently to vibrations made by struggling arthropods, consistent with their divergent foraging strategies and diet breadths. Finally, we found *Eciton burchellii* did not respond to odors of preferred prey of its congeners; however, vibrational stimuli allowed for a modest army ant response to potential prey irrespective of species identity. This work reveals that specialization on prey-sourced sensory stimuli provides a mechanism by which army ants partition food resources, potentially promoting coexistence. (GWU, STRI, NSF)

**3.2.88 MULTISENSORY NAVIGATION AND NEUROANATOMY
OF THE TROPICAL UNDERSTORY TWIG ANT
*PSEUDOMYRMEX BOOPIS***

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Sensory systems in animals are essential to resource acquisition, interacting with other individuals, and avoiding danger. Ants foraging in tropical rainforests experience diverse conditions along the vertical gradient from the bright canopy to the dim understory, likely facilitating the evolution of functionally biased sensory modalities. Neural tissue is energetically expensive, thus ants should exhibit habitat-based investment biases in specific brain regions. We explored how the neuroanatomy of *Pseudomyrmex* ants varies among species with contrasting habitat preferences along a vertical gradient. We measured the volume of the sensory regions of immunostained confocal 3D reconstructions of the brains of *P. boopis*, *P. gracilis*, and *P. oculatus*. We also experimentally examined the role of visual and olfactory cues in the homing behavior of *Pseudomyrmex boopis*, a diurnal, understory, twig-nesting ant. We temporarily occluded worker vision by painting over the compound eyes and ocelli (blind), only ocelli (ocelli-occluded), or only compound eyes (CE-occluded); controls were painted on the gaster. We also ablated antennae at their base (deantennated). We measured worker success in returning to their nest after displacement. Preliminary data suggest that the ratio of optic to antennal lobe investment in *P. boopis* and *P. gracilis* is similar and higher than that of *P. oculatus*, which tends to forage and nest higher in the canopy. We found that *P. boopis* workers exhibit visually-guided homing behavior that is most efficient when the antennae are intact. Homing success in blind and CE-occluded workers was significantly impaired compared to control, ocelli-occluded, and deantennated workers. A quarter of workers in treatment groups with compound eyes occluded were killed by other ants (*Odontomachus bauri*, *Ectatomma* spp.). Control and ocelli-occluded workers entered the nest more quickly than deantennated workers, suggesting that the detection of olfactory or tactile cues near the nest entrance is an important component of efficient homing behavior. The results of this study broaden our understanding of the selection pressures that accompany the transition from life in the rainforest understory to the canopy. (NSF, STRI)

3.2.89 DO ZOMBIE ANT FUNGI TURN THEIR HOSTS INTO LIGHT SEEKERS?

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Specialized parasites can modify the behavior hosts to increase chances of reproduction. This behavior is considered an example of extension phenotype of the parasite. The interactions between certain ant species and fungi of the genus *Ophiocordyceps* form an evident example. Once infected by *Ophiocordyceps camponoti-atricipis*, *Camponotus atriceps* ants die, biting at specific sites where abiotic conditions are optimal for fungal development. However, light is responsible for controlling the reproduction of several species of free-living fungi, and may play an important role in the terminal phase of parasitic fungal infection. Here, we evaluate the effect of illuminance and the incidence of dead manipulated *C. atriceps* ants. We used shading screens to reduce the luminosity in half of 10 previous identified graveyards (sites near of foraging trails with many infected dead ants). Such screens resulted in a clear reduction of incident light, as well as slightly higher, more stable humidity levels. We identified dead infected *C. atriceps* using colored marking ribbons. Only the infected ants that died after establishment of the plots were monitored. We measured the number of fruiting bodies, height above ground and the orientation of infected ants in the field. The selected sites of infected *C. atriceps* shows strong influence by experimental light reduction. The shaded areas received 53 ants (32,7%) in comparison to the adjacent control area, with 109 (67,3%) ants. In addition, in the shaded areas only 15 dead ants produced fruiting bodies. On the other hand, 41 dead ants developed fruiting bodies in the paired control areas. The infected *C. atriceps* also died at higher sites in the shaded areas (140 cm) in relation to the control areas (110 cm). Our findings suggest that light may have act in the place death of parasitized *C. atriceps* ants and therefore play an important role on reproductive cycle of the fungus *O. camponoti-atricipis*. CAPES/CNPq/CENBAM.

3.2.90 NOT EVERYTHING IS WHAT IT SEEMS TO BE: MUTUALISTIC NETWORKS BETWEEN ANTS AND TROPHOBIONTS AT DIFFERENT SPATIAL SCALES

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Mutualistic interactions are essential for biodiversity maintenance, being present in most ecosystems and involving different groups of organisms. The importance of studying these interactions at different spatial scales have been increasingly recognized. Studies in larger spatial scales (e.g. regional scale) can underestimate the peculiarities found only at the local scale, as well as subtle differences in the structure of species interactions between sites. Therefore, we aimed to assess if the *importance* of the species involved in ant-trophobiont mutualistic interactions is maintained across distinct sites and spatial scales. For this, we focused on the multi-interactive system involving ants, trophobionts, a hemiparasite (*Psittacanthus robustus*), and its host tree (*Vochysia thysioidea*). We performed this study in three environmentally similar mountainous areas of southeastern Brazil, Minas Gerais state. We used a beating technique and an entomological umbrella to sample insects present on 90 plants (30 per area). We built three species interaction networks which comprised ant-trophobiont interactions at each site, and one metanetwork which comprised all interactions at regional scale. In each network, core species of ants and trophobionts were classified based on their relative species strength (i.e., importance to the other trophic level). We found changes in the species strength of both ants and trophobionts between local and regional spatial scales, as well as between sites. *Camponotus rufipes* was the ant core species at Serra do Cipó, *Camponotus novogranadensis* and *Nesomyrmex sp1* were the core species at São João Del Rei, and *Brachymyrmex sp1* and *Cephalotes pusillus* were the core species at Serra da Moeda. At regional scale, only *C. rufipes*, *C. novogranadensis*, and *C. pusillus* stood out as core species. For trophobionts, we found *Guayaquila xiphias* and *Enchenopa loranthe* as core species both at local and regional scales. However, the effect size of the species strength of trophobionts to ants was different between distinct sites and scales. *E. loranthe* showed to be more important to ants only at Serra da Moeda. At the other sites, following the results of regional scale, ants depend more of *G. xiphias* than *E. loranthe*. In short, we showed that, even between environments with relatively similar conditions and resources, there is a marked distinction in species strength. Moreover, we also showed that the role of interacting species could be masked when different sites are grouped regional scale, evidencing the importance of studies involving interaction networks at different spatial scales. (FAPEMIG, CNPq, CAPES)

3.2.91 FLOWER DWELLING ANTS ASSOCIATED TO INSECT TROPHOBIONTS DOES NOT INFLUENCE VISITATION BY HUMMINGBIRD POLLINATORS IN TROPICAL MISTLETOE

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Interactions among floral visitors may directly influence plant fitness, but in some cases those interactions are indirectly affected by other organisms also attracted to flowers. Some aggressive ant species associated to insect trophobionts patrol entire plants and they can decrease herbivory on plants, since many of these ants occasionally prey on potential herbivores. However, the occurrence of these ants may bring some costs for the host plant. The presence of aggressive ants may influence the foraging behavior of pollinators, which may avoid reproductive structures jeopardizing plant reproduction. Given the possible ecological outcomes of these interactions, we thus asked the following question: How does the presence of ants in inflorescences influence the pollinators behavior? We hypothesized the pollinators should avoid branches used by the foraging ants. We selected ten individuals of *Psittacanthus robustus* present in the Campos Rupestres of Serra do Cipó, MG. We used experimental manipulation in natural conditions to simulate the presence / absence of ants. In each plant were randomly selected three reproductive branches with the same number of flowers and floral buds where we assigned each one of the following treatments: 1) 'No ants'; 2) 10 dead ants (*Camponotus rufipes*) fixed with glue; 3) 10 drops of glue (by itself as a control). All other inflorescences were cut off to induce visitation to experimental inflorescences. Ant access to all inflorescences was prevented by applying a sticky barrier of tanglefoot resin. Results showed the ant's presence in the inflorescences did not influence the number of visits and the number of nectar probes by the main pollinating bird (*Eupetionema macroura*). Thus, unlike frequently found in studies with invertebrate pollinators, hummingbirds showed no preference for branches where ants are absent. This probably occurs because these ants do not pose a significant threat to *E. macroura*, a hummingbird that presents an aggressive behavior toward competitors, eventually feeding on small insects. In addition, pollinators can use other than visual cues (e.g gustatory and tactile) to avoid foraging ants on inflorescences. Therefore, our study shows the interaction between aggressive ants and vertebrate pollinators can be neutral, despite the possible negative effects of ants on mistletoe herbivores. (UFMG, CNPq, FAPEMIG, CAPES).

ANTS AT SCHOOL: ACTIVITIES TO COMBAT THE LOSS OF HUMAN-NATURE INTERACTIONS

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Insects represent most of the diversity of animal species on the planet and among them the hymenoptera stand out for the ecological role they play in ecosystems. However, due to environmental changes occurring on the planet, many species of insects are threatened by extinction. In addition, there is also another kind of ongoing extinction, which is the loss of experience with nature that occurs with children due to new lifestyles in cities. One of the strategies to combat the extinction of the experience with the nature is the development of activities in the schools that approach the children of natural elements that compose the ecosystems. Fighting the extinction of experience with nature can help combat the extinction of species.. Ants are Hymenoptera and there are approximately 16,000 described species in the world. Ants are easy to find and manage to promote activities with children that enable them to connect with elements of the natural world and also help build scientific knowledge. In this sense, Ants in School is an initiative of the Laboratory of Ecology, Conservation and Mirmecology of the Federal Rural University of Rio de Janeiro, aiming to stimulate students to scientific practice and awareness of the importance of preserving nature through themes involving ants. Its target audience is primary school students from 1st to 9th grade. The activities occurred during 3 days and involved two groups of students from the 3rd year of elementary school (aged 8 to 9 years), from the Public School Caic Paulo Dacorso Filho located in Seropédica, Rio de Janeiro. The proposal consisted in carrying out interactive activities with the students, exploring several concepts of biology and ecology through the analysis of the life of the ants. The students participated in the activities carried out in the classroom and could observe the live ants during the activity. Throughout the time the interaction of the students was stimulated in order to contribute to the optimization of teaching and learning. In the end the students had time to express the experience they had through paper drawings they performed independently. (UFRRJ).

3.3 POPULATION, COMMUNITY AND ECOSYSTEM ECOLOGY AND BIOLOGICAL CONSERVATION

3.3.1 ANT COMMUNITIES BECAME MORE SPECIALIZED ALONG A SUCCESSIONAL GRADIENT IN CAATINGA DRY FOREST

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Changes in land use have reduced the coverage of natural ecosystems across the globe, making habitat loss and fragmentation the main threats to biodiversity persistence. The percentage of degraded areas that have been abandoned and are in the process of natural regeneration has increased in recent decades, increasing interest in studying the secondary succession process. In this context, it is important to understand how expected changes in environmental complexity, resources amount, and nutrients distribution can affect communities along secondary succession. Ants are useful taxa for the study of biodiversity patterns and nutrient ratios in tropical forests. They are dominant in most ecosystems and are responsible for maintaining many basic ecosystem services. Moreover, ants are usually opportunistic and their foraging decisions have shown preference for nutrients that are deficient in the environment. The aim of this work was to investigate if there are changes in the taxonomic structure, resource use and specialization of epigeic ant communities along a secondary succession gradient in the Caatinga. The work was developed in the Catimbau National Park (Pernambuco, Brazil), using 15 plots in areas with historical slash-and-burn agriculture and different time since abandonment (i.e. chronosequence). We use plant biomass as a proxy of succession. In each plot, six types of food resources were offered simultaneously for two hours: water, sugar, salt, amino-acid, honeydew and lipids. We collected a total of 27 species of ants in all sampled plots. Richness and abundance did not change along the biomass gradient, but species composition did. We observed that, although the nutrient use did not change, the ant communities became more specialized along the biomass gradient. These results indicate that the secondary succession process generates changes in ant community structure, with species with more specialized habits occurring at later stages of the succession. Our work brings important data about the reorganization of animal communities with the advance of the succession, besides contributing knowledge of the nutritional ecology of ants, from data collected in the field in semi-arid environments. (FACEPE, CNPq, CAPES)

3.3.2 ARMY ANTS OF PARANÁ (HYMENOPTERA: FORMICIDAE: DORYLINAE): SPECIES, DISTRIBUTION, AND FLIGHT PHENOLOGY

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The army ants are one of the most remarkable life forms found in the Neotropical region. They are characterized by an unusual combination of morphological and behavioural traits and there are few animals amongst the leaf litter that can rival these ants. Nevertheless, knowledge of their biology is limited to some “model” species. For the most species, their biology is unknown as many are subterranean and present at low abundances. In this group, gynes are permanently wingless, so winged males represent the unique dispersal agent and have a key importance in maintaining genetic diversity. Males can tell us many things, such as the diversity and detection of rarely collected species, and their reproductive biology. Here we evaluated the mating flight phenology and diversity of army ant males sampled continuously over two years (1986-1988) from light traps placed in 8 localities representing the main geomorphological and floristic regions of Paraná State in Brazil. A total of 6,217 males belonging to 22 species were collected: *Eciton* (3 species), *Labidus* (3 species), *Neivamyrmex* (14 species) and *Nomamyrmex* (2 species). Two *Neivamyrmex* species are recorded for the first time to Paraná, one *Labidus* and eight *Neivamyrmex* species for the first time in Southern Brazil. Our preliminary results show synchronized flight activity among species of *Neivamyrmex* and *Nomamyrmex* respectively, while segregation occurred among *Eciton* and two *Labidus* species respectively. For most species, flight activity was restricted to two months, while in some species it lasted five months. Presently, we will be testing how diversity changes over time, for each locality and between localities and also test the amount of overlap in flight activity in congeneric species, and the interaction between temperature, rainfall, humidity and abundance over the two years. The length of the sampling and the geographic scale of coverage represents an unprecedented amount of information to be analysed for ant flight phenology in a tropical region. (CNPq)

3.3.3 SUMMER NUPTIAL FLIGHT ACTIVITY OF THE ANTS OF THE ATLANTIC FOREST

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The study of the time span of the nuptial flights of the ants at the species level can help understanding dispersion mode and success of species establishment in the environment. The nuptial flight is the most important dispersion mode for most ants and its study might be the most efficient way to report species living in tall vegetation or deep in the soil. Our study aim was to report the nuptial flight of a well-known community ants of the Atlantic Forest biome in Brazil during the summer period. We installed 18 small suspended Malaise traps in Mata do Paraíso, a semideciduous rainforest fragment in Viçosa, Minas Gerais, Brazil. Traps were separated by a distance greater than 50m and stayed in the field for five months, between December, 2016 and May, 2017. We collected 1917 winged ants, 475 females and 1442 males. Females were sorted into ten subfamilies, 42 genera and 126 species/morphospecies, while males were sorted in nine subfamilies, 47 genera and 196 species/morphospecies. We have data of the time span of the nuptial flight for all these male and female morphospecies. It must be stressed though that many of the male morphospecies certainly belong to a given female-based species/morphospecies. In accordance with other studies in tropical regions, we observed an asynchronous nuptial flight, with the start and end of the flights occurring in different dates for each species or even genera, for exemple, *Brachymyrmex* had its flight peak in early summer (December) while *Acantosthichus* had its peak in early fall (April). This different strategies of recruiting might avoid environmental adversities, such as and predation or flooding. This asynchronous flights can contribute to the reproductive isolation and speciation process. We also report the presence of rare or unusual genera, such as *Leptanilloides* (males in two morphospecies) and *Cylindromyrmex* (males and queens in two morphospecies). Moreover, we identified new species of the genera *Fulakora* and *Rhopalothrix*. The asynchronous pattern detected and the great diversity sampled, with many new recordings (even considering that the diversity of ants previously known for the site was high), highlight the importance of studying alate ants to enhance the understanding of the biodiversity of the Atlantic Forest biome. (UFV, UFES, CAPES)

3.3.4 YOU ARE WHAT YOU EAT (AREN'T YOU?) - APPLICATIONS AND LIMITATIONS OF FATTY ACID ANALYSIS IN ANT TROPHIC ECOLOGY

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Use of trophic resources is a central aspect of community functioning. However, assessing species' niches is challenging, particularly for inconspicuous animals in complex and species-rich communities. Direct observation and chemical analyses have complementary limitations and advantages, which can be combined to study trophic ecology. Fatty acids are assimilated from the diet and stored as neutral lipid fatty acids (NLFAs) in insects' fat bodies. Individual NLFAs may act as biomarkers of specific food sources, and overall profiles may indicate dietary patterns. However, the technique is still incipient for terrestrial organisms, and depends on the physiology of each taxon. Thus, our goal was to develop and apply fatty acid analysis for the first time to study ant trophic ecology. Laboratory experiments showed that ant NLFA profiles are fairly generalized, with predominance of fatty acids that most animals can synthesize, such as C16:0, C18:0 and C18:1n9. Nevertheless, some fatty acids are not synthesized or only in small amounts, and increase conspicuously when acquired from diet. These constitute potential biomarkers, such as C18:2n6, C18:3n3 and C18:3n6. Fatty acid dynamics is similar between species, and between adults and larvae. NLFA composition is also stable between individuals of the same colony. On the other hand, amounts of stored fat are highly variable between individuals of the same colony and between life stages. When compared to field data from a tropical epigeic ant community, NLFA compositions were correlated with resource use, thus they may be used to infer diet similarities. However, no individual fatty acid stood out as a clear biomarker. Temperate species present distinct amounts and compositions from tropical ones, with remarkable prominence of C18:1n9, which may be related to other physiological factors, rather than diet differences. These studies suggest that fatty acid analysis is a powerful tool to study partition and overlap of trophic niches in ants, bringing information that is more specific than stable isotopes, and more time-representative than field observations or analysis of gut content. However, its application as biomarkers to identify specific food sources seems limited, at least in the epigeic stratum. For this, researchers are advised to use the more stable compositions, but analyzing amounts may bring insights on other physiological mechanisms of ants (DFG, CNPq, SDV).

3.3.5 THE ANT FAUNA OF THE PARQUE ESTADUAL DAS LAURÁCEAS: A RESERVE OF ATLANTIC FOREST IN PARANÁ, SOUTHERN BRAZIL

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Compilation of species occurrences represents one of the first steps for establishing conservation actions and monitoring programs. One of the best-known applications of species lists is to provide essential data for analysis of diversity and ecological patterns, enabling the identification of rare, ecologically relevant or threatened species. Inventories are also important for taxonomy, enabling the access of new records from poorly known species and the description of putative new ones. However, comprehensive invertebrate surveys are scarce if compared to vertebrate groups. Considering all arthropods that inhabit tropical forests, ants are a particularly important group. They play an important role in terrestrial environment dynamics, participating in most ecological process, such as predation and nutrient cycling. They can also be used in bioindication, since they are abundant and easily sampled, while being used to access the response of biodiversity to human impact. However, one of the main difficulties in generating a list of ant species is the accurate taxonomic identification. Comprehensive surveys of ants are, generally, more focused on ecological patterns than taxonomic studies. The aim of this work is to contribute taxonomically with the ant fauna survey of the *Parque Estadual das Lauráceas* (PEL), an Atlantic Forest area located in the municipality of Tunas do Paraná, state of Paraná, Brazil. It is also intended to evaluate the modification of the ant fauna and the addition of new records through the comparison with a previous inventory already carried out in this area almost 20 years ago. Manual sampling and Winkler extraction (20 samples) were performed in PEL in 2017. In addition, for comparative purposes, we used data from the Biota Project sampling event in PEL in 2001 representing 50 Winkler samples. A total of 174 ant species were recorded, belonging to 34 genera and nine subfamilies. We recorded 144 species (31 genera and nine subfamilies) in the Biota samples and 114 species (31 genera and eight subfamilies) in the 2017 samples. Almost half of the species were nominally identified (70 species; 40% of the total). Five species represent new records for the state. This study constitutes one of the few ant inventories on the southern areas of Atlantic Forest. Our results may support the evaluation of ant diversity in the Atlantic Forest, a biome extremely threatened by human activities. (CNPq, USAID/NAS)

3.3.6 TEMPORAL THRESHOLD OF CERRADO REGENERATION IN THE ANT COMMUNITY

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The Cerrado is a hotspot threatened by agriculture and livestock activities. Since ants could be used as bioindicators of environmental changes such as regeneration, degradation and preservation, we aimed to evaluate the influence of successional stages on the ant species richness, composition of fauna and the relationship between the trophic guilds and successional stages of regeneration in an area of Brazilian Cerrado, testing the hypotheses that (i) the richness and diversity of ants is higher in areas with advanced successional stages, (ii) generalist species are more frequent in areas of initial succession and specialists in areas with advanced successional stages and preserved areas and (iii) as more advanced the ecological succession of an area, greater is the similarity of the ant fauna composition. The study occurred in a rural property at Ribas do Rio Pardo, Mato Grosso do Sul, Brazil, and included active pastures with six months of formation, areas with several years of abandonment and different degrees of natural Cerrado regeneration, and two large remnants of native forest with at least 40 years of preservation. Collections were carried out in 56 plots using sardine baits and active search for a period of one hour in each plot. Further the regeneration age, we evaluated successional stages by measuring vegetal characteristics in each plot. To verify the effect of the successional stages we performed a quadratic regression between the average richness and the total number of ant species as a function of the areas' regeneration age, as well as generalist species as a function of the regeneration age of the areas. A non-parametric multidimensional scaling was made to visualize the community structure of different restoration ages, and direct ordering between the environmental heterogeneity and the ants species, verifying the relationship between environmental variables and species composition. A total of 60 species, distributed in 28 genera from eight subfamilies were obtained, besides a direct relationship between areas' regeneration age and the richness and diversity of ants. Additionally, areas with initial regeneration there had a greater proportion of generalist species, decreased proportionally with increase in plant succession. A temporal threshold between five/six years of regeneration was verified, from when the community structure tended to stabilize. We also observed that maintaining a minimum amount of vegetation in areas destined for livestock is an adequate and efficient way to preserve the Cerrado's biodiversity. (CAPES)

3.3.7 INFLUENCE OF THE DISTANCE OF AN AREA SOURCE OF WEALTH IN AN AMAZON FRAGMENT

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Loss of habitat is one of the greatest threats to biodiversity. Thus, there is a great need to preserve forest fragments, since the reduction of areas causes reduction of richness and changes in species composition. Considering the importance of an environmental assessment, the objective of the study was to verify if the richness of ants is influenced by an area of native forest from its proximity to the fragment, testing the hypothesis that the plots closer to the area would present greater richness of ant species. In addition to verify there is similarity of the composition of ants among the plots in relation to the distance between them. The collections were carried out between July and August 2018, in a rural property with approximately nine hectares (258 x 416m), located in the municipality of Pontes e Lacerda, Mato Grosso, Brazil (15°11'24.85"S 59°22'52.22"W). The area of study is a spot of Amazonian domain, surrounded on three sides by pasture and one of native forest (35 hectares). For the sampling, 19 plots of 10 m² were randomized, using active search and sardine bait for the collections. Thus, five baits were allocated in the soil and five in the vegetation. Both methodologies lasted for one hour per plot. For the data analysis, a linear regression was performed between the ant species richness and the distance of the plots in relation to the native forest area located next to the fragment. For the similarity of the plot between the distance, it was compared the composition matrices and the distances between the plots with the Mantel test. It was collected 78 species, distributed in 26 genera and seven subfamilies, being: Dolichoderinae, Dorylinae, Ectatomminae, Formicinae, Myrmicinae, Ponerinae and Pseudomyrmecinae. Among all the genera collected, Formicinae presented the highest richness, with 13 species. When we performed a linear regression between the ant richness as a function of the distance from the native forest area, we verified that there was no influence of the adjacent forest area on the ant richness ($p = 0.62$), since the most distant area presented greater richness than some of the nearest plots. However, there is a weak relationship between community composition and distance between plots ($R^2 = 0.14$; $p = 0.02$) indicating that local conditions within the fragment may be more important for ant fauna composition than simply the distance between the area of origin.

3.3.8 DIVERSITY OF ANTS (HYMENOPTERA: FORMICIDAE) IN URBAN FOREST FRAGMENTS IN THE MUNICIPALITY OF ALTAMIRA-PA

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The urbanization process decreases the availability of natural habitats causing loss in biodiversity. The maintenance of forest fragments (in urban areas) is a way to minimize the loss in biodiversity, once increasing the quantity and quality of natural habitats. Ants present foraging and establishment of colonies limited, mainly, by the temperature, humidity and availability of the resources. Thus, changes in landscape and land use (by urbanization) may change the structure of communities. Thus our goal is evaluated the structure of the composition of ant genera in forest remnants of the urban area of Altamira - PA. The fieldwork were carried out in three sampled points; (i) Sítio Jaburu, characterized by shrub vegetation and fruit trees, (ii) Bethânia Training Center, located on the edge of the city and (iii) Federal Institute of Education of Pará - IFPA, both characterized by less impacted vegetation, shrub, forest and fruit. At each sampling point, 18 pitfall fall traps were installed in transects of 20 meters, nine on the surface of the ground and nine in trunk of trees, remaining in the field for 48h. To evaluate the difference in composition among the three fragments, we performed a PERMANOVA applying the Jaccard index and using the trap position (soil or tree) as a covariate. The collected individuals were identified at the gender level. We observe eight subfamilies and thirty four genera, being Myrmicinae, Ectatomminae, Formicinae, the most frequent subfamilies and the most abundant genera were *Atta*, *Ectatomma*, *Crematogaster*. We observed no interaction between type of trap and locality (* $F_{(2,17)} = 1.239$, $p = 0.112$) and only the difference between the types of traps (* $F_{(1,17)} = 2.632$, $p = 0.001$, $R^2 = 0.116$) show relationship with composition structure. The composition similarity between sites can be explained by the characteristics of each site. All sites may be understood as an island of resources in a urban landscape, an oasis of vegetation within the urban area. However, the results also showed differences between vegetation (traps in trunks) and litter (traps in the soil) diversity, this interaction can be explained by the specific behavior observed in the ants. In fact, the condition and availability of resources differs between these habitats allowing different genera can occupy these two habitats, explaining the difference in the composition.

3.3.9 COMPOSITION AND STRUCTURE OF ANTS ASSEMBLAGES (HYMENOPTERA: FORMICIDAE) IN DIFFERENT CROPPING SYSTEMS OF URBAN AGRICULTURE IN HAVANA, CUBA

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The taxonomic composition, structure, functional groups, ecological diversity and similarity of ant assemblages were studied in three cropping systems: Organoponic (O), Intensive garden (IG) and Typical plots (TP) of an urban agricultural production system. The study was carried out in the Basic Unit of Cooperative Production "1st of July", in Cerro Municipality, province of Havana, Cuba. The sampling was performed by using pitfall traps arranged linearly, with a sampling effort of 72 hours / trap. A total of 120 traps were placed per cropping system. The location of the traps was made according to the designs or spatiotemporal arrangements of the crops. There were 23 species, 17 genera and four subfamilies; 65% were cosmopolitans. The number of ant species observed did not differ significantly from that estimated. The richness of species observed fluctuated between 84-96% of the species estimated for the three cropping systems. The most frequent species were *Solenopsis geminata*, *Wasmannia auropunctata*, *Brachymyrmex heeri* and *Paratrechina longicornis*. Nine functional groups (GF) were determined. The functional group with the highest number of species (12) was the ground and vegetation opportunists (GVO), followed by that of the dominant omnivorous of ground and vegetation (DOM) species with three species and the ground omnivorous and scavengers (GOS), with two species. There is a clear relationship between the species richness observed and the effective number of species in each set. The most species rich assemblages, IG and O, were also the assemblages with the highest effective number of species respectively. The analysis of spatial ordering NMDS showed that the O and IG culture systems were more related to each other, whereas TP was the most different system in terms of composition and total frequency. The total frequency between culture systems only differed significantly between TP and IG ($p = 0.008$). The total beta diversity (β to) showed that the O and IG culture systems are the least dissimilar among them (36%), while the most dissimilar were the IG – TP pair (62%). In the regression tree, the factor that most influenced the frequency of ants was the crop cycle of 1-3 months.

3.3.10 OVERLAP OF ANT SPECIES IN TWIGS ON THE LITTER

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Rain forest litter is rich in arthropods, especially ants. In this stratum, ants use different resources to nest and protect the colonies. Twigs resulting from three fragmentations are frequently occupied. In this sense, their diameter is specially linked to the richness of ant communities. Furthermore, some species seem to prefer twigs with specific diameter. This study answers whether there is overlap in the occupation of twigs by different species of ants that inhabit the litter, using the diameter as a variable. Twigs were collected between 2010 and 2015, in 16 fragments of the Atlantic Forest located in environmental protection areas in the State of São Paulo, Brazil. All twigs were collected in each fragment comprising six to seven plots (4 x 4 m), totaling 112 plots (1,792 m² of litter). We performed three measurements of twig diameter using a digital caliper (mm): one at each end of the twig and one at its center; then, we calculated the simple arithmetic mean of the diameter of each twig. Twigs containing ≥ 10 workers or containing immature ants, queens, or winged males were classified as occupied. For analyses, species with less than six twigs occupied in the total samples were excluded. Then, species were subjected to contrast analysis by aggregate levels. We found 793 twigs occupied by 7 subfamilies, 18 genera, and 28 species of ants. Analyses showed ranges of species overlap, detecting three distinct groups. The first group, with 19 species, occupies twigs with a diameter that does not exceed the average of 18 mm. The second group, with 8 species, occupies twigs with average diameter up to 28 mm. Finally, the third group, represented only by *Pheidole* gr. *tristis*, occupies twigs an average diameter greater than 30 mm. We conclude that there is overlap in the occupation of twigs by different species of ants, especially considering those with smaller diameter, which suggests preference for a certain size of twig (CAPES, CNPQ, FAPESP).

3.3.11 A COMPARED EVALUATION OF TAXONOMIC AND FUNCTIONAL DIVERSITIES OF LEAF-LITTER ANTS IN THE BRAZILIAN ATLANTIC FOREST

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The search for understanding the implications of changes in biodiversity has shown that variations both in species and functional diversity can lead to changes in environmental mechanisms since several ecological processes are influenced by the number and nature of species of a given location. The present study investigated the taxonomic and functional diversity of leaf-litter ants in 65 forest sites in the Brazilian Atlantic rainforest in the southern region of the state of Bahia, Brazil. In addition, we aimed to understand the patterns between taxonomic and functional diversities using two different resolutions of classification of ants into functional groups. We used an adaptation of the ALL protocol, commonly used in studies in the Atlantic Forest. In total, fifty leaf litter samples were collected at each site, and mini-Winkler apparatuses were used to extract the ant fauna. We used two classifications of ant in functional groups. First we classified the ants according to the traditional scheme used for Neotropical ants, based on natural history information, phylogeny, micro-habitat distribution, eye size, body size and shape; In the second classification, we added also more specific aspects and current information available about the biology of the different species. We compared the ant richness with the number of ant functional groups for the two classifications used using the number of ant species per site and the number of functional groups per site by linear regression. We identified 364 ant species belonging to 68 genera in 10 subfamilies in 65 regions. The ant richness varies from 51 to 102 between localities. Considering all data, the accumulation curve does not reach a plateau and continues growing, despite the number of localities sampled. However, this pattern is completely different when singletons and doubletons are plotted separately from other species. Considering a more general functional classification we identified a total of 13 ant functional groups and 26 ant functional groups considering a more specific functional classification. We observed that ant species richness and the number of functional groups are not closely related metrics, especially when considering a more general functional classification. Moreover, even when considering a more specific functional classification, the relationship with ant richness is moderate. These results suggest that the number of species in a given group does not necessarily reflect the role played by that group within the environment. Integrating different biodiversity perspectives is crucial for the successful conservation of the Atlantic Forest ants. (CEPLAC, UESB, UESC, FAPESB, CNPq)

3.3.12 HOW TO CONVERT PESTS INTO FLAGSHIP SPECIES FOR CONSERVATION: THE CASE OF ATLANTIC FOREST ANTS

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Although scientists declared a red alert for the decline of insect populations and extinctions, human societies view insects more as pests than as organisms to be preserved. About half of the known species are under population decline and one third of them endangered. Considering such scenario, conservation strategies are needed to reverse or mitigate this situation. The use of flagship species, such as big mammals, is a strategy to attract the society's attention for conservation issues or to generate funds for such. However, the flagship species do not ensure the conservation of certain insect species, and an alternative is to use insects directly as flagship species. Three insect categories can be used as flagships: charismatics, endangered species and ecosystems service providers. In Brazil, 28 books about ants were published between 1917 and 2017, with most of them talking about ants as agricultural pests. Ants considered as pests in agriculture are a few species of *Atta* and *Acromyrmex* genera, which even for leafcutters, does not matches to the whole play of this species as ecosystems engineers and ecosystems services providers. The objective of this work is to discuss how ants could overcome the charismatic challenge to become conservation flagships. According to the Red Book, there are thirteen threatened ant species in Brazil and all of them are endemic from Atlantic forest. The ants can be used as flagships for the conservation of Atlantic forest because they are threatened by habitat loss and mainly because they are important ecosystem service providers. An alternative to overcome the charismatic challenge and the cultural pest stereotype of ants, aiming to use them as flagships, is to expose their beauty through macro photos associated to information about their ecological importance. Teaching about the ecosystem services they provide is important to change the public perception about ants, promoting their positive public image. In addition, field guide books can be an important strategy to promote the ants public image through macro photos and information about their natural history. It can allow the public to have a direct contact with them when using the guides in field observations and engage people into the conservation of ants and hence to the entire Atlantic Forest. (CNPq, CAPES, REGUA).

3.3.13 LARGE, ISOLATED AND EXOTIC TREES AFFECT ONLY THE ASSEMBLY OF NOCTURNAL TREE ANTS IN AN URBAN ENVIRONMENT

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Urbanization has been growing in an accelerated way, being able to interfere on the arrangement of organisms. However, understanding what factors affect the fauna associated with urban environments is of recent interest of Ecology, since we seek the comprehension of the effects that urbanization has upon these organisms. Thus, urban ecology targets on describing and explaining the processes that determine the abundance and distribution of organisms in the cities and urban centers. This way, studying biodiversity within urban ecosystems may help promote future decision-makings of how to compose a green area that favors a good functioning to the biota and the well-being of those who visit it. With that, we tested which structural characteristics of the trees, within the Federal University of Sergipe – São Cristóvão campus, affect the structure of the tree ant assembly in two different periods of the day. Thirty trees were drawn and we collected the ants using attractive baits in two periods of the day (8:00 – 12:00 and 20:00 – 00:00). Thus, we used species richness, incidence and average beta-diversity as response variables, and circumference, chest height, distance from the closest tree, whether the tree is an exotic species and whether the tree has extrafloral nectaries as explanatory variables. We verified that diurnal and nocturnal assemblies are distinct and that *Camponotus blandus* e *Ca. melanoticus* showed specialist patterns for day and night, respectively, and *Cephalotes pusillus* as generalist for day periods, being found in both periods. Beta-diversity of the nocturnal fauna ws the only variable to respond to the structural patterns of the trees. This way, factors such as size, isolation and whether the plant is exotic modulate the compositional change for nocturnal tree ants. All these factors affect positively the beta-diversity of nocturnal tree ants. Having extrafloral nectaries was not an important predictor for the structuration of the fauna of tree ants in both periods. Thus, in order to obtain a better planning for the management of green areas within the campus, the use of nocturnal tree ants is important. This way, keeping the largest and more connected tress in the campus is interesting, besides promoting an alternation between native and exotic trees in the University, in order to keep a high diversity of tree ants. (FAPITEC)

3.3.14 EFFECTS OF LAND-USE CHANGE ON THE TAXONOMIC AND MORPHOLOGICAL TRAIT COMPOSITION OF NEOTROPICAL ANT ASSEMBLAGES

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Anthropogenic disturbances have been increasingly modifying the structure of natural ecosystems, with cascading effects on their component species and the ecological services they provide. Many studies have used taxonomic diversity as the sole indicator of the effects of habitat disturbance on plant and animal communities, even though in many cases information on the morphological traits of species can help understanding the responses of entire assemblages to environmental change. The Brazilian Savanna (Cerrado) is one of the most threatened biomes of the world, particularly due to the rapid expansion of agriculture. In this study, we evaluated the extent to which changes in land-use and land cover in the Cerrado affects the taxonomic composition of ant communities and the morphological traits of their component species. We sampled ants in five habitats representing a gradient of land-use intensification and tree woody cover: semideciduous forests, eucalyptus plantations, savannas, planted pastures and soy plantations. Ground-dwelling ants were sampled along line transects using pitfall traps. We then selected six continuous morphometric measures and two ordinal measures to describe species traits. We recorded 219 species of ants belonging to 48 genera across all land-use types. Soy plantations presented the lowest species richness; savannas the highest. Pasture, eucalyptus plantations and forests had similar species richness. Habitat type also significantly affected assemblage composition and post hoc tests showed that all land-uses differed from each other. Extremes in morphological traits were most strongly associated with soy plantations and forests: soy plantations were dominated by small, hairless, long-legged ants with dorsally positioned eyes, while forests supported larger, short-legged ants with laterally positioned eyes. Except for soy plantations, all land-uses had relatively high species richness. However, the differences in species composition across those habitats may be associated with a loss of ecological functions with land-use intensification as shown by morphological traits. (PPG Ecologia UFU, CNPq, CAPES, FAPEMIG)

3.3.15 TROPHIC STRUCTURE OF ARBOREAL AND GROUND DWELLING ANTS IN SAVANNAS AND FORESTS OF CENTRAL BRAZIL

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The trophic structure of biological communities reflects the carbon and protein resources available in the environment. Stable-isotope analyzes of carbon and nitrogen have been used successfully in ecological studies to assess the trophic position of organisms and their energy flow. Previous studies indicate that ant assemblages are often composed of species that occupy largely different trophic positions. However, most of the studies conducted so far have focused on assemblages within a single site, and only a few studies have investigated the differences in the trophic structure of ant communities in contrasting habitats. Here, we performed carbon (C) and nitrogen (N) stable isotopes analyses to assess potential differences on the trophic structure between ant assemblages associated with different habitats (forest and savanna), and foraging strata (ground or arboreal). We collected samples of ants, and also of herbivorous insects, spiders, plants, and soil, as a control for local isotopic values, in an ecological reserve in Uberlândia, central Brazil. The arboreal ant communities of both forest and savanna habitats had a significant lower average $\delta^{15}\text{N}$ than the ground-dwelling communities. However, there were no differences in average $\delta^{15}\text{N}$ between overall (i.e. ground and arboreal) forest and savanna ant communities, even when we compared the values within ants from the same genus and subfamily. In both forest and savanna, there was a positive correlation between $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$, indicating that species with higher trophic positions had also higher $\delta^{13}\text{C}$ levels. Interestingly, among savanna ant species (n=47), 91.5 % obtained less than half of their carbon from C₄ grasses, even though they are extremely abundant in such environments. Overall, the results obtained here indicated a much higher similarity in the trophic structure between ants from forest and savanna, and a much lower similarity between ants that forage on the arboreal and ground strata. This fact can be explained by the much marked differences on ant species composition between the different strata than between habitats. However, this explanation is only partial, since in some cases the same ant species can exhibit a plasticity in their diet across the different habitats. Furthermore, the fact that distinct species from the same genus but associated to different strata had different isotopic signatures indicates that the nesting habits have an influence on the evolution of feeding habits of ant species. (PPG Ecologia UFU, CNPq, CAPES, FAPEMIG)

3.3.16 PATTERNS IN ANT FORAGING ACTIVITY: A MACROECOLOGICAL PERSPECTIVE OF THE ROLE OF ENVIRONMENTAL FACTORS IN DIFFERENT HABITAT STRATA

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Through the search and consumption of food resources, species are part of ecological interactions, energy flows and nutrient cycles. These play a key role in ecosystem functioning. Ants, for example, play a role in several ecological processes such as seed dispersal, scavenging, predation, plant defense and the cycling of nutrients. They are, therefore, important in food webs. In this sense, understanding how environmental factors influence their foraging activities will allow us to outline the link between animals and ecosystem processes. Here, we ask how environmental factors (temperature, precipitation, temperature seasonality and net primary productivity) are related to the occurrence of foraging ants (OFA) in different habitat strata. We hypothesized that all environmental factors influence OFA positively. To do so, we carried out standardized samples in the six Brazilian domains (Amazon, Atlantic rainforest, Cerrado, Caatinga, Pampa and Pantanal). We sampled along 10 transects with 75 sampling points per transect in each domain, offering liquid resources in arboreal, epigaeic and subterranean habitat strata. We also obtained data on net primary productivity (NPP), precipitation, temperature and temperature seasonality per transect. OFA was highest in the epigaeic stratum, followed by the arboreal and subterranean strata. We also found that the OFA was highest in more productive, wetter, warmer and less seasonal environments. However, the influence of NPP and seasonality on OFA depended on the habitat strata, with arboreal ants the most sensitive. Temperature could act in the ant workers' velocity to find resources. Precipitation could act protecting ants against desiccation via moisture, which might improve foraging performances. NPP possibly improve species populations' size, which allow more ant workers to forage. Probably, in highly seasonal environments, harsh seasonal periods could decrease species populations' size that results in less ant workers spread in these environments to obtain resources. In addition, the effects of NPP and seasonality seems to decrease in magnitude from arboreal to epigaeic and to subterraneous strata. These effects could match the degree to which ants are dependent on plant productivity and the degree to which each stratum can buffer

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changes in climate. We concluded that temperature, precipitation, temperature seasonality and NPP influence OFA in Brazilian domains. However, NPP and seasonality act differently in different habitat strata. This might indicate that the role of environmental factors in controlling ecosystem functioning differs depending on habitat strata. (CAPES, FAPEMIG, RUFFORD)

3.3.17 ANT COMMUNITY RESPONSE UNDER TOPSOIL TRANSFER IN A DISTURBED AREA

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Hydroelectric power plant constructions usually eliminate vegetation cover and remove superficial soil horizons. Furthermore, promotes soil compaction, organic matter and nutrients reductions and soil C-horizon exposition. Topsoil transfer is a commonly technique used to restore disturbed areas where soil quality has been reduced. Recent studies addressed the importance of the use of easily observable ecological indicators to evaluate the success of environmental restoration projects. Ants are commonly used as bioindicators, once changes in ant assemblages can reflect broader ecological change, as they have effective participation in many ecosystem services, such as influencing resources availability for other organisms through chemical and physical changes in the soil. Here we asked whether ground-foraging ants can be used to indicate the efficiency of topsoil transference, as a tool to restore disturbed areas. Thus, we tested if (i) ant species richness and composition differ among reference areas (Cerrado bioma forest), control areas (i.e., degraded areas without interference) and areas with topsoil; and to test if (2) species richness and composition in topsoil areas has changed in time since its transference (until now, 5 months). To do so, we transferred a layer of red latosoil (15cm) covered with a layer of topsoil (10cm) to a degraded area in October 2018 and since then, we have been monitoring the ground-foraging ant fauna in studied areas, using pitfall traps. We have accomplished two field collections, one and five months after the experiment installation. So far, we have found 80 ant morphospecies. Species richness varied significantly between the treatments: control area presented higher species richness in both months, followed by topsoil in November and reference area in March. Besides that, reference area showed higher increment in species richness, followed by control and topsoil treatments. Additionally, species composition varied significantly between treatments and between sampled months. Results indicated that topsoil transposition provides a new habitat for ant community, explaining the changes in species richness and composition throughout time. Our findings indicate that ant fauna richness and composition might be good indicators to evaluate ecological restoration projects evolution and success. (UFOP, CEMIG)

3.3.18 THE FRAGMENTS OF THE ATLANTIC RAINFOREST IS SHELTER FOR RARE SPECIES ANTS

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The Atlantic Rainforest is the second largest tropical rainforest in South America. It is one of the hot spots of biodiversity, and only 8.5% of the original vegetation remains. Faced with the accelerated process of anthropic interference, conservation strategies become fundamental there. As rare species are considered a vulnerable to extinction, understanding their significance in the community is an important tool for assessing areas for conservation. We already know that most species of the Atlantic Rainforest are rare. But for many taxa, rare species are not yet known. We classified the seven forms of rarity of Rabinowitz of ant species that occur in Atlantic Rainforest fragments located in the southeast region of São Paulo State, Brazil. We considered 154 ant species from the biological collection “Silvia Sayuri Suguituru”; subspecies and morphospecies were not included. The classification of rarity levels follows the scheme proposed by “Rabinowitz’s Forms of Rarity”, which comprises eight classes. One form is called “common” and the others are part of seven forms of rarity. In this case, the last class (“Form7”) is the rarest. For classification in rarity form, we adopted the following criteria: (1) “Geographic range”, data on the geographic distribution of the species, available in the Global Biodiversity Information Facility - GBIF; for species absent in GBIF, data from “antmaps.org” were used; (2) “Habitat specificity”, considering as habitat the different phytophysionomies where species occur; (3) “Local population size”, the population size was calculated based on the number of occurrence of each species in the areas analyzed. We identified eight classes, in which “common” represented 42.86% species and 57.14% were classified in some form of rarity. The “form1” accounted for 3.25% of the species, “form2” 5.84%, “form3” 5.84%, “form4” 24.68%, “form5” 3.90%, “form6” 3.25% and “form7” 10.39%. Species considered regionally rare may not appear on lists of endangered species, which undoubtedly undermines conservation strategies. According to the last edition of the Red Book of the Endangered Brazilian Fauna, species *Neivamyrmex pilosus* (“Form3”), *Nomamyrmex esenbeckii* (“Form3”), *Rasopone ferruginea* (“Form3”), *Pachycondyla lenis* (“Form5”) and *Neoponera bucki* (“Form7”) are listed as “Least Concern”, and only *Brachymyrmex micromegas* (“Form5”) is in the category “Endangered”. Our results demonstrate that forest fragments have a high number of species with different rarity levels. (FAPESP, CAPES)

3.3.19 CAN ANTS ASSEMBLIES (HYMENOPTERA: FORMICIDAE) INDICATE RECOVERY OF PERMANENT PRESERVATION AREAS?

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Anthropogenic activities have impacts on environmental species sustainability and conservation in threaten biomes. Some organisms should be used as predictors of environmental changes. With the increasing number of Hydroelectric Power Plants (HPP) and the constant biomes fragmentation, increases the need to understand the biotic regeneration dynamics in Permanent Preservation Areas (PPA) adjacent to hydroelectric dams. The PPA formation in the surroundings of the dam lakes helps to mitigate the impacts of the enterprise on biodiversity. Formicidae presents richness, abundance, geographical distribution and quickly response to environmental changes, revealing a indicator potential that allows the environmental biomonitoring to evaluate the conditions and changes in the equilibrium restoration of the affected ecosystems. This study evaluated the richness, abundance and composition of ants assemblages occurring in the PPA area of Foz do Chapecó HPP, one of the largest HPP in southern Brazil, after seven years of isolation for regeneration. Sampling was carried out at five sites, with distinct land use histories, using pitfalls traps, entomological umbrella, sweep net, sardine and glucose baits, and manual collection. Assemblies were evaluated according to the richness, abundance and diversity index (H). There were sampled 122 species belonging to 36 genera. The greatest richness found was for Myrmicinae (S = 41) and *Pheidole* (S = 20) and the highest abundance for *Pheidole aberrans* Mayr, 1868 (n = 46). The diversity index (H') ranged from 2.85 to 3.81 according to the degree of regeneration of each site, showing that the richness and abundance differ according to the environment complexity and the niches availability constituted through the land use. The sites with the most advanced regeneration process presented higher richness, abundance and diversity (H'), besides higher percentage of exclusive species. The equitability was greater than 0.5 in all environments. The richness may be 60.5% higher than that observed. Together, our results reveal that the ant fauna richness, abundance and composition can be predictors of the regeneration stage of PPA. They point out that assemblies of ants respond to PPA reconstitution process after the implementation of projects such as HPP, therefore, they play an important role in the design of recovery strategies and environmental conservation. (UNOCHAPECÓ, ICMBio).

**3.3.20 PRELIMINARY INVENTORY OF ANTS
(HYMENOPTERA: FORMICIDAE) RICHNESS IN
PARQUE ESTADUAL DO TURVO, DERRUBADAS, RS**

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Environmental conservation units (ECU) are refuges for the preservation of biodiversity. The Parque Estadual do Turvo is the largest remnant of Semidecidual Forest and the largest integral protection area in the Rio Grande do Sul State. The ant fauna of the southern Atlantic Forest biome is relatively well known, however, there is a lack of studies on ants assemblies occurring in ECU and no record for the Turvo area. The studies already carried out in this region suggest the existence of rich ants assemblages present in the most varied environments and a study on the richness and abundance of these insects in the park can contribute to the understanding of the ecological process consolidation and to subsidize strategies of biodiversity preservation. In this context, this study aimed to evaluate the richness, abundance and composition of ant assemblies that occur in the Parque Estadual do Turvo (UC). A sampling was carried out in January of 2019, in five points distributed along the adjacent area to the road that crosses the ECU, using pitfalls, entomological umbrella, sweep net, sardine and glucose baits and collection manual. Preliminary results show a recording of 122 species belonging to 35 genera of eight subfamilies. The richest subfamily was Myrmicinae ($S = 42$) and the richest genus was *Pheidole* ($S = 20$). The highest abundance (number of occurrences in the samples) was found for *Pheidole lignicola* Mayr, 1887. The observed richness reiterates the potential of the ants in the biodiversity indication and the environmental conservation state of the ECU. It serves as parameter for subsequent evaluations of anthropogenic impacts and conservation strategies of this type of environment. Presents an inventory of the ants species present in the ECU and, above all, adds information about the richness of ant occurrences for the region. (UNOCHAPECÓ, ICMBio)

3.3.21 COMPOSITION OF THE GROUND-DWELLING ANTS IN AREAS OF PASTURE, RESTORATION AND FOREST FRAGMENT

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Monitoring is an important tool for assessing the success of forest restoration. One way to detect and monitor the patterns of change in biodiversity is to use species or communities as environmental indicators. The ants present high richness of local and global species, numerical dominance and are sensitive to environmental modifications, which make them excellent environmental indicators. In the areas in the process of forest restoration, a species replacement occurs over time. It is assumed that over the years, the areas of forest restoration will move into the condition of a native forest, with increased biodiversity and ecological relations. We evaluated the composition of the ant ground-dwelling fauna in areas of pasture, forest restoration and forest fragment. The surveys were realized at the Centro de Experimentos Florestais of SOS Mata Atlântica, in Itu, and at the Universidade Federal de São Carlos, in Araras, both in State of São Paulo, Brazil. The local vegetation is characterized as Semideciduous Seasonal Forest. Five areas were selected: pasture (PA); recent restoration (RR); intermediate restoration (IR); old restoration (OR); and fragment of secondary forest (FF). Ants were collected using five pitfall traps (plot of 100 m² per area; 48 hours) in the dry and rainy seasons. To verify the similarity of species between the environments, a similarity analysis (ANOSIM) was performed and for the ordering of the environments a Nonmetric Multidimensional Scaling (NMDS). A total of 4,799 ants were sampled, distributed in 32 genera and 74 species/morphospecies. The most richest genera were *Pheidole* (20) and *Camponotus* (11). The environment in the intermediate stage of restoration, presented higher species richness of ants (54). In pasture 48 morphospecies, recent restoration 51, old restoration 42 and forest 45. In the ordering of the environments according to the species by NMDS, the graph reveals a grouping related to the pasture, differentiating it from the other environments. The ANOSIM test presented significant results among the environments of PA x OR; RR x OR and RR x FF. The correlation values indicate a greater dissimilarity in the composition of ants of the recent restoration with the old restoration and forest, indicating a possible colonization of the recent restoration by species of ants from the pasture. The results demonstrate that the ants can act as important ecological indicators, being animals of easy sampling. (CNPq)

3.3.22 FIRST ANT INVENTORY AT THE WESTERNMOST LIMIT OF THE BRAZILIAN AMAZON

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In this work we carried out the first ant inventory of the extreme west of Brazilian Amazon. The study area was the Serra do Divisor National Park (PNSD), which covers five municipalities in the State of Acre, northern Brazil. Three sampling methods were employed: manual collecting, pitfall traps and Winkler extractors. The 1 m² leaf-litter samples were collected in each of the three main trails of PNSD: Formosa (7°26'17.19" S 73°39'27.39" W), Barreiro (7°27'9.22" S 73°39'58".24 W) and Mirante (7° 26' 56.65 S 73°40'13.94" W), totalizing 30 samples submitted to the Winkler extractor. Pitfall traps were employed according to the AntPeld protocol, which consists in three transects of 500 m, spaced 1 km apart. In each transect 20 traps were installed, separated 25 m from each other, and totaling 60 samples. Ants collected were processed and identified to the specific level at the Laboratório de Sistemática e Biologia de Formigas of the Universidade Federal do Paraná (UFPR), Curitiba, Brazil. Vouchers were deposited at the Padre Jesus Santiago Moure Entomological Collection of UFPR (DZUP). So far, 160 species in 54 genera and 10 subfamilies were recorded for the PNSD. From these, eight genera are recorded for the first time from Acre (*Fulakora*, *Prionopelta*, *Neocerapachys*, *Syscia*, *Lachnomymex*, *Nesomymex*, *Discothyrea*, and *Rhopalothrix*). In addition, 26 species are recorded for the first in Acre, and nine of them also represent first records for Brazil. This study considerably expands the knowledge about the myrmecological fauna in this region of Amazon and, hopefully, can be of use for several future studies and conservation measures. (UFPR, USAID, FUNDAÇÃO ARAUCÁRIA)

3.3.23 INFLUENCE OF EDGE EFFECT ON THE COMPOSITION OF ANT (HYMENOPTERA, FORMICIDAE) IN URBAN FRAGMENT OF BRAZILIAN SAVANNA

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The Brazilian Savanna is the second largest Brazilian biome, occupying about 21% of the national territory. Due to the process of land using, it is estimated that there is only 30% of the original territory. The fragments effects reduce biodiversity and lead to the isolation of species, and border effects turn the fragment vulnerable, affecting the survival of the species. Considering the need for monitoring, ants being used as a tool to analyze the environmental quality. The objective of this study was to compare the composition of ants of the border and of the interior and of different stratum in an urban fragment of Brazilian Savanna, testing the hypotheses that the border will present less richness than the interior and that the soil will present lower richness of the than the vegetation, due to the edge effect and the greater proportion of vegetation cover in the fragment. The collections were carried out in July 2018 in an urban fragment of approximately 11 ha, in Jardim municipality, Mato Grosso do Sul state. The fragment is composed of dense vegetation and open areas with grasses, influenced by water courses in an urban matrix. Twenty plots (10x10 m) were randomized, being considered as border (n = 12) those that were in a space of 100m from the margin of the fragment, the remains was considered as interior (n = 8). For ant's collection was used sardine bait in the soil and in the vegetation for the period of one hour per plot. The relative frequency of the species in the baits was used for analyzes, NMDS was used to verify the composition of species among the border, interior and in the different stratum. Thirty-five species in 13 genera and six subfamilies were found. The border showed the highest richness (31 species), when compare to interior (23 species). In relation to the stratum, the border vegetation presented greater richness (23 species) following by interior soil (15 species). From the NMDS, was verified there is a difference in ant species composition mainly in the soil inside the fragment (stress = 0.1484). Therefore, we verified a different composition of species collected in the soil of the most central region of the fragment. Thus, we observed that the border effect influences the composition, since the species are primary/secondary, with a higher proportion of generalists, while those of the interior are secondary/climatic with a higher proportion of specialists.

3.3.24 SO MANY USEFUL IDIOTS: UNIVERSITY CAMPI AS URBAN HOTSPOTS OF ANT BIODIVERSITY

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Urban centers often present low ant diversity, because many species cannot withstand anthropogenic disturbances. However, some species thrive in these urban habitats, such as cosmopolitan tramp species. The presence of green areas also increase habitat heterogeneity and complexity, thus serving as shelter for native species as well. In this way, urban areas with high heterogeneity are important for biodiversity conservation. This is the case of university campi, which usually contain a mosaic of green patches and highly modified areas. Our study aims to assess patterns of species richness and composition in the campus of Universidade Federal de Santa Catarina, Florianópolis-SC, southern Brazil, and its role as an urban hotspot of biodiversity. We analyzed 18 sites along a gradient of anthropogenic disturbance. In each site, we sampled ants with four sardine baits on the ground, exposed for one hour, and 45 minutes of hand collection. Sites were classified into disturbance levels through the average of four variables (vegetation type and cover, ground type and pedestrian flow). We found 78 ant species, belonging to 27 genera, with estimated richness of 95 species (Chao2). The richness per site ranged from five to 23 species. Cluster analysis and ordination suggested more similar composition among sites with comparable structure. Species richness was negatively related to disturbance level (GLM). We recorded a few cosmopolitan tramp species (*Cardiocondyla* sp.1, *Monomorium floricola*, *Paratrechina longicornis*, *Tapinoma melanocephalum*), although in low frequencies. The most frequent ants belonged to native species adapted to open areas, such as *Solenopsis cf. saevissima*, *Wasmannia auropunctata*, *Acromyrmex disciger* and *Dorymyrmex* sp.01. The native species *Neoponera villosa*, *Odontomachus chelifer* and *Pachycondyla striata* occurred only in habitats with higher stratification and vegetation cover. These results suggest that the campus offers important habitats for native species. Even within an urbanized environment, those species may perform ecological roles such as nutrient cycling and interaction with other species. However, green patches are fundamental to shelter forest species.

3.3.25 HOW ANT ASSEMBLAGES ARE STRUCTURED IN RESTORING FOREST: SPATIAL AND TEMPORAL ANALYSIS OF SPECIES CO-OCCURRENCE USING DIFFERENT SAMPLING TECHNIQUES

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In community ecology, we seek to understand which forces structure biological communities. Community assembly rules indicate competition as a strong structuring factor in which species or groups of ecologically similar species (functional groups) do not co-occur or co-occur less than expected from neutral model. However, habitat characteristics are also pointed as structuring factors that can cause aggregation or segregation of species. The structure of ant assemblages has been studied in different ecosystems, but more frequently it involves only one season and a single sampling technique. We apply null model analyzes to create random communities and compare to the observed community studied in different habitats, seasons, and sampling techniques. We address the following questions: (I) will the pattern of ant community structuring be based on positive (aggregated) or negative (segregated) relationships between species within functional groups; the non-random pattern is maintained when analyzed by: (II) habitat type (III) sampling season, or (IV) sampling techniques. The species of ants were collected in a restoring forest, with approximately 12 years age, in the Atlantic forest biome. The samples were taken under the canopy of four tree species; for two years, in dry and rainy seasons; with three different sampling techniques (Winkler, pitfall, and berlese). The sampled ant species were distributed in functional groups according to the literature. Matrices of presence/absence of species in different ant assemblages were elaborated for each habitat (tree species), sampling season, and technique. The matrices were analyzed for species co-occurrences through analysis of null models, with a metric (C-score) and fixed-fixed (FF) and fixed-equiprobable (FE) randomization algorithms. The results suggest that (I) the structure of ant assemblages are random or segregated; (II) results are less dependent of the ant assemblage than the habitat type, sampling season, and technique; (III) FF model resulted in random and FE in segregated co-occurrence patterns. Therefore, our study demonstrated that to obtain more robust patterns on species co-occurrence it is necessary to take into account not only the habitat type but also the sampling season and the technique used to collect the ants. (CAPES)

3.3.26 DIVERSITY OF ANTS (HYMENOPTERA: FORMICIDAE) IN A TOPOSEQUENCE OF THE SEMI-ARID TO THE PRE-AMAZON, BRAZILIAN

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Ants biodiversity is directly related to the structure of the environments in which they occur, and strongly related to the type of vegetation cover and soil. It creates specific ecological conditions for occurrence of ants and other endogeic insects. In this study, we investigate the diversity of ants in a toposequence from semi-arid of the Caatinga and Cerrado to eastern Amazon forest (between Piauí and Maranhão State in North of Brazil) to verify if there is association between the occurrence of ants with the landscape (soil and vegetation cover). The study was carried out in the transition area between dry and wet forests. Soil dominains and vegetation cover allow us share the focus area in three landscapes: Lithic Entisol - Caatinga; Yelow Oxisol - Cerrado, and Plinthich Alfisol - Palm. The landscapes spread for 170 km distributed as follows: 30 km of Caatinga, 60 km of Cerrado, 50 km in transition area between Cerrado and Amazon forest (with dominancy of Palm tree), and 40 km of Amazon forest. The study area was divided in 17 sites separated 10 km away from each other 170 km away. To collect the ants, 30 baits composite of carbohydrate and protein were distributed equidistantly and alternately at one transect of 300 meters from at each sampling site. A total of 8.311 specimens were collected, distributed in 7 subfamilies and 23 genera. *Pheidole* was the richest and most abundant genera with 3,491 individuals. The diversity of ants was relatively low, possibly because only ants collected by attractive baits were considered for this analysis. Most of the genera have had continuous geographic distribution in all landscape such as *Forelius*, *Tapinoma*, *Brachymyrmex*, *Camponotus*, *Nylanderia*, *Paratrechina*, *Ectatomma*, *Cephalotes*, *Crematogaster*, *Pheidole*, *Solenopsis*, and *Pseudomyrmex*. However, *Dorymyrmex* and *Gnamptogenys* occurred only in the Yelow Oxisol - Cerrado. *Acromyrmex*, *Blepharidata*, *Ochetomyrmex*, *Odontomachus*, and *Pachycondyla* occurred only in the Plinthich Alfisol- Palm. No genus was exclusive to the Entisol Lithic - Caatinga. The agrupament analyse show that the soil with greatest diversity of ants was Plinthich, being separated from the other landscape studied. The richness of the ants communities in Plinthich soil probably is associated to hidromorfic condition this soil, that accumulates and reserve water mainly dry season. The Entisol Lithic - Caatinga and Yelow Oxisol - Cerrado landscapes have more genera of ants in common, once that landscapes are spatially close and located in a semiarid region. (FAPEMA, UFMA, MPEG).

3.3.27 HOW DEGRADED AREAS AFFECT THE INTERACTION OF ANTS AND DIASPORES?

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The degradation of natural areas, due to the expansion of anthropic activities, affects distinct ecosystem services. Ants and plants interact at community level forming complex ecological interactive systems. Ants play's an important role in ecosystems as seed-removers. The understanding of these interactions is helpful to evaluate ecosystem functioning response under disturbance. Here we evaluated the effect of the complete removal of vegetation on the interactions between ants and diaspores. We tested: (i) whether the rate of diaspores removal, removal time and distance, frequency and diversity of ant-diaspore interactions vary between disturbed and preserved environments (ii) whether the structure of interaction networks vary between disturbed and preserved environments (iii) What are the species with bioindication potential for disturbed environments? We conducted the experiment in distinct disturbed and preserved cerrado areas located in the municipality of Catalão (GO). For removal rates and measurements, we calculated the percentage of artificial diaspores removed after 24 hours of exposure; nine transects in degraded areas and nine in disturbed areas, in 36 points with 20 diaspores. Through focal observations, we assessed ant behavior upon diaspores (12 sampling points, in the disturbed and 12 sampling points, in the preserved areas): species that interacted, depulped and/or removed diaspores. There was no significant difference in any of the variables when comparing disturbed vs. preserved areas. However, the environmental impact affected the structure of interaction networks. The networks exhibited greater modularity (Q: 1.37% higher) and specialization (H2': 1.24% higher) in the preserved, while nestedness was higher in disturbed area (WNODF: 5.8%). The species *Ectatomma Permagnum* presented the highest indication value for the degraded environment, emphasizing the influence of this generalist species on seed removal for these areas. These results indicate that the lower availability of resource in the disturbed area prompted a greater dominance of few species upon the experimental resources. In addition, the ants are bioindicators of efficacy in disturbed areas, performing greater activities of removal of diaspores and depulping. These findings contribute to the understanding of how anthropogenic disturbances affect seed dispersal by ants, which might be used as a tool for to recover degraded areas. (UFLA, UFOP, CEMIG)

3.3.28 ASSOCIATION BETWEEN *AZTECA CHARTIFEX* AND LIANAS AFFECTS ANTS DIVERSITY IN FOREST CANOPY

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Understanding how community structure is shaped becomes fundamental for a better understanding of relationships between organisms. In this context, ants can serve as study models. In addition to being a relevant group in relation to biomass and abundance, ants perform several ecological functions, especially in forest canopies. Considering that habitat complexity affects arthropod community in environment, liana presence in forest canopies contributes to maintenance of this complexity, increasing species richness of arboreal ant community. However, even if canopy complexity contributes to increase of ant species richness, interspecific relationships can also affect the community structure. In this study, we tested synergistic effect of habitat complexity and arboreal predator ant presence, *Azteca chartifex*. Thus, we asked whether *A. chartifex* presence, associated with habitat complexity, affects diversity of co-occurring arboreal ants. To detect effect of this association, we sampled ants from 68 trees in State Park of Rio Doce - MG, where all trees had lianas in their crowns and 32 had nest *A. chartifex*. Of these trees, we raffled 34 individuals and did manual removal of lianas. We distributed trees in four treatments: i) *A. chartifex* present and liana present (n = 16); ii) *A. chartifex* absent and liana present (n = 18); iii) *A. chartifex* present and liana removed (n = 16); and iv) *A. chartifex* absent and liana removed (n = 18). We have seen that abundance and species richness of ants co-occurrences were negatively affected by interaction of *A. chartifex* and liana. The negative *A. chartifex* effect was accentuated by liana absence, abruptly reducing the species richness and abundance of other ants. Given the minimum *A. chartifex* abundance foraging trees without liana, we observed that it was enough to affect other ants. Without liana presence, probably sub-dominant ants are more vulnerable to predation by *A. chartifex*, because places of refuges become scarce. We also detected that best scenario for co-occurring ants is in *A. chartifex* absence and in lianas presence, in which the most prominent species was *Crematogaster* sp. Our work has demonstrated that the effects of interspecific interactions among arboreal ants can be affected by liana presence, a component of high environment abundance and present in canopies of tropical forests. (UFOP, FAPEMIG, CNPq)

3.3.29 CHANGE IN PROPORTION OF PARABIOTIC ANT-GARDEN ANTS DURING NEST INCREASE

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Ant-Garden ants are complex mutualistic interaction that involve ants and epiphytes. In this interaction, the ants offer a nutrient-rich substrate, disperse and plant the seeds, and protected against herbivory when the epiphyte grow. There are few ant species involved in that interaction and the Ant-Garden more widely distributed, occurring throughout the Amazon, involve two ant species, *Camponotus femoratus* and *Crematogaster levior*, living together in Parabioses. Parabiotic species share the nest and the foraging trails, but prevent against overlap in your activities to avoid competition and potentiate they survival. Only the nest foundation of *Neoponera goeldii* are known, so how is the division of labor in the life history of the parabiotic ant nest is unknown. We believe that one of parabiotic species found the nest and that the proportion of ant species change with the nest maturity, that emerge new maintenance and protection tasks. To test this, we analyse the composition of 20 Ant-Gardens of different sizes in an Amazonian forest located in the Fazenda São Nicolau, municipality of Cotriguaçu, Mato Grosso state, Brazil. In these 20 nests that ranged of 0,017 to 59,301 dm³, we counted 163,867 ant workers, being 67,223 of *Camponotus femoratus* (average: 3361.15; SD± 3996.81) and 96,644 of *Crematogaster levior* species (average: 4832.2; SD± 3676.46). The number of *Camponotus femoratus* and *Crematogaster levior* workers increase with the nest grow. But the ratio of worker species differs with the nest size, with the proportion of *Camponotus femoratus* increasing and *Crematogaster levior* decreasing with the nest growth. As demonstrated in other workers, *Camponotus femoratus* has more involvement in the seed dispersal and defence of the nest. Therefore, *Crematogaster levior* start the nest and *Camponotus femoratus* arrive to plant the epiphyte. The increase of the nest size and density of epiphyte demands more defence, which leads to the increase of the proportion of *Camponotus femoratus* as our data demonstrate. (UNEMAT, FAPEMAT, ONF)

3.3.30 DO YOU WANT FISH OR ARE YOU A VEGETARIAN ANT? DOMINANCE AND FOOD PREFERENCES IN ANT-GARDEN ANTS *CAMPONOTUS FEMORATUS* AND *CREMATOGASTER LEVIOR*

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Ant-Garden ants are a mutualistic interaction that involve ants and more than one species of epiphytes living together. In Ant-Garden, the ants disperse and plant the epiphyte seeds, incorporating nutrient to the substrate and protecting them against herbivory. Some ant species are involved in this interaction but *Camponotus femoratus* and *Crematogaster levior*, living together in Parabioses, is the Ant-Garden more widely distributed along the Amazon. It is known that parabiotic ant species share the nest and the foraging trails, but it's expected that these ants differentiate their activities to avoid competition and maximize their survival. Little is known about this niche partition of this parabiotic ants, mainly about foraging behaviour, only that *Camponotus femoratus* prefer bigger and more sugar-rich nectaries. Because this, we study the food preference and if it differ between period of the day (morning and night) and habitat strata in the Fazenda São Nicolau, municipality of Cotriguaçu, Mato Grosso state, Brazil. To do this, we administer a dessert spoonful of sardine (protein) on a piece of paper and in another paper arranged next (30 to 60cm), a spoon of alimentary glucose. We administer this treatment in soil and vegetation near each Ant-garden. We replicate this experiment in 10 nests totaling 40 baits. *Camponotus femoratus* was present in greater abundance in protein baits, regardless of stratum and time. *Crematogaster levior* dominated the carbohydrate baits independent of the period and stratum. Both species presented agonistic behaviour scaring other species of the resource, such as *Atta sexdens*, *Camponotus* aff *balzani*, *Camponotus* aff *melanoticus*, *Cephalotes atratus*, *Ectatomma lugens*, *Neoponera apicalis*, *Pseudomyrmex tenuis*, *Solenopsis* sp, *Nylanderia* sp and *Wasmannia auropunctata*. Other species were observed visiting the baits while the parabiotic ants weren't present (*Azteca* sp, *Odontomachus* sp and *Trachymyrmex* sp) or not presented conflict with the parabiotic ants (*Pheidole* aff *flavens*, *Pheidole* aff *radoszkowski* and *Pheidole* sp). These results show that parabiotic ants differentiate their food niche and are dominant species that difficult other species to access the resource, being able to modify the local community. (ONF, UNEMAT, FAPEMAT)

3.3.31 RESPONSE OF ANT ACTIVITY AND MORPHOLOGY TO SOIL MOISTURE SEASONALITY IN AN AMAZON FOREST FRAGMENT

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The tiny free space on pore system play an expressive pressure on ant species to access underground layers. This pressure could be higher when pores are at least filled by water, which could limit ant activity and the few ants foraging underground should have a small body size. In this study, we test the prediction that increasing soil moisture fewer free space would be available from ants forage, resulting in a lower ant activity in underground soil layers and ants should present small body size. The ants were direct sampled from soil samples from two plots in a forest fragment at campus of the Universidade Federal do Acre. Each plot was divided into 12 subplots, which for one year, monthly, one subplot was dug, and ants were sampled from five soil depths (10 - 50 cm) and a soil sampled was collected to obtained soil moisture, global soil density and soil particles density. We considered the number of ant workers sampled at each soil depth as a proxy of the ant activity and the mesosoma length (Weber length) as surrogate of ant body size. The soil porosity was the difference between soil particles density and global soil density. The volume of free-soil pore was the difference between soil porosity and soil moisture and means the free space available for ants move underground. The increasing of soil moisture led to the decreasing of volume of free-soil pore. Decreasing the volume of free-soil pore less ant workers were founded in all soil depths and these ants presented smaller mesosoma length. Thus, soil moisture could be considered as an important driver on ants use of underground soil layers because it markedly influences the free space among soil particles which require small body size and limiting ant activity. Therefore, our study contributes to the understanding of the mechanisms behind community assembly of subterranean ant assemblages. (CNPq, FAPAC, UFAC)

3.3.32 THE JOINT EFFECTS OF AGRICULTURE INTENSIFICATION AND LANDSCAPE SIMPLIFICATION ON ANT COMMUNITIES

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Landscape simplification through deforestation and agriculture intensification are two important drivers of changes in animal communities. These two forces frequently act together at different scales determining community richness and composition. On the other hand, the maintenance of trees in the landscapes such as hedgerows in farms is important for conserving biodiversity. In order to disentangle the effects of these different drivers, here we assessed the impacts of farming management intensity (FMI), amount of tree elements and forest fragments on different scales, on ant community richness and composition change along a land use gradient. Ants were collected in 18 farms in an agricultural landscape in Cachoeiras de Macacu - RJ. On each farm we set 5 pitfall traps 20m apart. Pitfall traps remained open for 48 hours in the dry and wet season. We used a farming FMI index based on pesticide use, fertilization and soil tilling, which were assessed with semi-structured interviews. Forest fragment areas and tree elements were evaluated with GIS software. We built generalized linear models using a poisson distribution for richness. We selected the variable with greater weighted importance value within each scale (40, 110, 350, 1100m). Then, we ran a second model selection with the four selected variables. In order to assess community composition change, we plotted a NMDS graphic and evaluated the effect of the variables using GLM with the former model selection approach, where NMDS axes were dependent of the measured variables with normal distribution. We collected 2023 individuals from 41 species of 18 genera. Community richness was mainly affected by tree elements within 110m radius, and by connectedness of farm to forest fragments at 1100m radius. FMI index at 40m radius and connectedness at 1100m radius were also important predictors of community composition represented by NMDS1, but NMDS2 was not consistently affected by any model. Despite the acknowledged importance of large scale effects of land use change, especially forest loss at the landscape, local factors such as the maintenance of hedgerows and reduced local FMI (especially pesticide input) can increase species persistence in agricultural landscapes. This spots opportunities to preserve biodiversity and associated environmental services without setting aside productive land, given that many native trees can be sold and improve food sovereignty at rural landscapes. (Embrapa, CNPq, FAPERJ)

3.3.33 ANT FAUNA CHANGE WITH HETEROGENEITY IN VEGETATION DENSITY IN FOREST FRAGMENTS OF AN ANTHROPIC AMAZONIAN LANDSCAPE

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Ants are notable insects for their ecological dominance as predators, necrophagous, and indirect herbivores in almost all terrestrial ecosystems, with the exception of the poles. They can occupy several niches in the arboreal, soil and subsoil strata developing diverse strategies of foraging and nests construction. The patterns that regulate the distribution and structure of ant communities in their various habitats are not fully understood. However, heterogeneity, habitat complexity and variations in climatic conditions are correlated with the structural composition and limitation of the communities of these insects. Therefore, we evaluated whether the composition of the arboreal ant species is influenced by the heterogeneity of the vegetation densities in forest fragments in Southern Amazonia. For each, ants were sampled in the vegetation above 1.30 m in height by beating tray method (entomological umbrella adapted method) in eight quadrants of 4 m². In all, 10 transects were sampled in eight fragments between the municipalities of Alta Floresta-MT and Paranaíta-MT, Brazil, between June and September 2017. At each of the eight points of the each transect where the ants were sampled, four measures around the 4m² were taken (North, South, East and West). We calculated the means per point and the standard deviation of the transect, representing the heterogeneity of the vegetation densification. We had a total of 799 frequencies of Formicidae and the workers sampled belonged to 6 subfamilies, 17 genera and 56 species. We verified that the vegetation densification influences the composition of the ant fauna, both in the frequency and in the species richness of ants. Furthermore, greater heterogeneity in plant densification leads to a higher turnover of species in the fragment. These results allowed to conclude that the heterogeneity in vegetal density is determinant in the composition of the arboreal myrmecofauna emphasizing the importance in knowing the influence of the variation of the habitat in ant biodiversity. (UNEMAT, FAPEMAT)

3.3.34 ANT FAUNA IN PERMANENT PRESERVATION AREAS AND FOREST PLANTS IN THE NORTHWEST OF RIO GRANDE DO SUL

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The ants comprise a very diverse taxon of insects, present high richness and are ecologically important in different terrestrial ecosystems. The richness and diversity of ants tend to increase according to the complexity of the environments in terms of vegetation and biodiversity conservation stage. This study aimed to characterize the ants assemblages that occur in two permanent preservation areas, described as fragments of native vegetation surrounded by crops, and two eucalyptus plantations, surrounded by crops and pastures. The study was carried out in the Frederico Westphalen (27 ° 21 '27", 53 ° 23' 40" W) municipality, in the northwestern region of Rio Grande do Sul. Ten pitfall traps and 20 baits, 10 sardines and 10 glucose in each area were used. The richness was defined as the number of species that occurred in each samples and was compared by a rarefaction analysis based on the number of occurrences. The relationship between ant species and the different environments was verified through a Principal Component Analysis (PCA). The samples presented a richness of 71 species belonging to 19 genera, five subfamilies. Seven species occurred in the four environments sampled. The species sampled represented 65.7% of the ant fauna already recorded for Northwest Rio Grande do Sul region environments and 34.3% for Santa Catarina western region. The Myrmicinae subfamily and *Pheidole* and *Camponotus* genera were the richest in the study. A significant difference was observed regarding the richness, abundance and composition of ant assemblages among the sampled environments. The ant species list increases information about the myrmecofauna for a region of the state of Rio Grande do Sul that is still poorly sampled. Although, richness, abundance, diversity and equitability point to differences between the sampled environments. Part of the difference may be associated with sampling and intrinsic climatic variations of the sampling events in each environment. Additional samples in similar environments in the region may contribute to increase the knowledge of the myrmecofauna and to the understanding the associated factors. However, it should be noted that the results of this research can be used to know and update of ant occurrences in the state of Rio Grande do Sul, as well as to serve as a basis for the construction of management plans and the conservation of invertebrate fauna, considering APP areas and eucalyptus plantations. (Unochapecó, CAPES)

3.3.35 ANTS IN URBAN ENVIRONMENTS IN THE NORTHWEST REGION OF RIO GRANDE DO SUL

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Ants occurring in urban areas have been focus of studies in recent years; however, the myrmecofauna of many regions remains unknown. Studies on ant assemblages in urban green areas make it possible to evaluate the impacts of the urbanization process on myrmecofauna and on biodiversity in general. This study evaluated the richness and abundance of ants assemblages occurring in urban environments in the northwestern region of Rio Grande do Sul. Five cities were sampled: Frederico Westphalen, Caçara, Seberi, Taquaruçu do Sul and Vista Alegre, and two types of environments: squares and vacant lots. Samples were obtained between February and May 2018, using glucose and sardine baits and manual collection. The ant assemblies of each city were characterized by richness and frequency of occurrences. Shannon diversity indexes (H'), Equitability (J') and richness estimates (Chao 1) were calculated. The richness of each environment (squares and vacant lots) was compared by a rarefaction analysis. A total of 9,772 specimens of ants were sampled, 468 occurrences registered, 57 species belonging to 19 genera and five subfamilies. Species occurred exclusively in four of the five cities and seven species occurred in all cities. The richest genera were *Pheidole* ($S = 13$), *Linepithema* ($S = 7$) and *Camponotus* ($S = 6$). The sampled myrmecofauna showed differences in the richness of the different environments sampled, however, smaller when compared to other urban environments in the southern region of Brazil. The estimator pointed out that the richness of the five cities may be 63.4% higher than the sampled. In this context, the importance of additional inventories in the region emerges for a better understanding of the factors that may be acting on ant assemblies and associated biodiversity. Squares and urban green areas are not just ant shelters. These environments serve as places for coexistence, leisure and physical activity practices for humans. Above all, they offer contact with nature, health and quality of life to the population. Expanding and maintaining spaces of this nature in the cities is not just a way of conserving ant assemblies, it is a human need. In this sense, this study can serve as a basis for management plans, conservation and expansion of squares and green areas. (Unochapecó, CAPES)

3.3.36 MYRMECOFAUNA OF THE INLAND PALEO-DUNES OF THE MIDDLE SÃO FRANCISCO RIVER, NORTHEASTERN BRAZIL, ECOREGION OF THE CAATINGA BIOME

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The Caatinga is a biome of about 800,000 km² situated in northeastern Brazil. In the inland the climate is semi-arid and prolonged drought can exceed one year. The Caatinga presents a great diversity of environments conditioned by a mosaic of types of vegetation varying with the relief, the types of soils and the availability of water. One of its incredible ecoregions is the “dunes of the middle São Francisco river”. It is one of the nine Late Quaternary inland dune systems of South America east of the Andes. The vegetation of the sand dunes is composed of deciduous, thorny scrub woodlands, herbaceous plant, bromeliads and cactus that form island of plant litter. The dunes shelter endemic species of Squamata and one of Mammalia. The ecoregion is considered as a priority area for conservation. However, although the Squamata of the dunes are well studied is not the case for the Arthropoda. The principal objective of this project is to make the first inventory of the ants from this peculiar ecoregion of Caatinga, that will be the start point of other studies like new species description or natural history reports. Several expeditions were carried out in the dunes of Ibiraba and Casa Nova (Bahia State), at the southwest and northeast of the ecoregion respectively. The ants were collected by active visual search mainly at night, pitfall traps on the ground, entomological umbrella and by sifting plant litter in a basin. The ants were stocked in alcohol before being sorted, dry mounted and identified. A total of 44 species of 18 genus and seven subfamilies were found: 22 Myrmicinae (1 *Acromyrmex*, 3 *Cephalotes*, 2 *Crematogaster*, 1 *Cyphomyrmex*, 2 *Nesomyrmex*, 6 *Pheidole*, 7 *Solenopsis*); six Formicinae (1 *Brachymyrmex*, 5 *Camponotus*); six Dolichoderinae (4 *Dorymyrmex*, 1 *Forelius*, 1 unidentified genus); five Ponerinae (1 *Dinoponera*, 1 *Hypoponera*, 2 *Platythyrea*, 1 *Thaumatomyrmex*); two Pseudomyrmecinae (2 *Pseudomyrmex*); two Dorylinae (2 males of different unidentified species); and one Ectatomminae (1 *Ectatomma*). The southwest and northeast of the ecoregion are two separate dunes complexes and their homogeneity is questionable. Thus, the genus *Platythyrea* has one species in each one. One is new to science like one of *Nesomyrmex* and one of *Thaumatomyrmex*. These first results reveal some of the diversity and complexity of these dunes and bring into focus one of these inland dune systems of South America certainly all filled to the brim with myrmecological treasures. (UNIVASF, CNPq, FACEPE)

3.3.37 IDENTIFICATION OF PRIORITY AREAS FOR ANT INVENTORIES IN BRAZIL: INTEGRATING HISTORY OF RECORDS AND HABITAT LOSS DATA

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Habitat loss is the main cause of the local and global disappearance of species, which may occur even before they are recorded or even described. On the other hand, the deficiency of species distribution data and large sampling biases can directly affect inferences about patterns of species richness that form the basis of conservation strategies. Insects, despite their large ecosystemic role, are still largely neglected when dealing with biological inventories. Among insects, ants are organisms of unique importance because of their species richness, life habits, abundance, distribution, and diverse biological interactions. In this work, we classify the Brazilian regions (biomes and ecoregions) according to the priority for new ant surveys based on the distribution of current records and recent habitat loss data, between the years 2000 and 2016. We constructed a dataset with almost 8,000 records of ant occurrence in Brazil. These data were compiled from the literature and from an online database, the AntWeb platform. The measures of habitat loss used presented different aspects regarding the changes of the natural vegetation, reflecting in variations in the collection priorities for each unit of study. The Caatinga was the biome showing the greatest urgency to carry out new inventories, whereas the Atlantic Forest was the biome with relatively lower urgency. However, there considerable differences of priority between ecoregions belonging to each of biome, which highlighted the need to pay special attention to these units, given that they contain a more homogeneous vegetation cover and probably a characteristic associated ant species composition. The choice of future research foci according to a combination of habitat loss intensity and prior biological knowledge can be a valuable starting point for filling knowledge gaps by helping with new conservation strategies. The occurrence dataset constructed here may also be very useful in studies on the distribution of myrmecofauna in Brazil, helping to uncover important macroecological patterns.

3.3.38 TAXONOMIC AND MORPHOLOGICAL DIVERSITY OF ANTS (HYMENOPTERA: FORMICIDAE) IN THE BRAZILIAN AMAZON

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Tropical forest ecosystems host at least two-thirds of the Earth's terrestrial biodiversity and provide significant local, regional and global benefits through the provision of ecosystem functions. In tropical forest soil, these functions are mainly provided by invertebrates, such as ants, an ecologically dominant group. If environmental factors such as soil type, soil texture and soil grain size may drive morphological changes in ant assemblages or in species richness, their relation to ant morphological diversity (and probably functions) is still unclear. Here, we describe and analyze ant morphological diversity within six different soil formations (biogeochemical regions) found in the Brazilian Amazon. Based on high definition images and data from over 400 taxonomic publications, we constructed an extensive database of morphological traits for all ant species recorded in the Brazilian Amazon. Species occurrence data for 1,026 ant species (or 62% of the Brazilian ant fauna) were recorded (GABI project) and analyzed. Our results show that biogeochemical regions characterized by higher ant species richness were not consistently associated with highest ant morphological diversity. Further, low variation in the median distribution of morphological ant traits among biogeochemical regions was found, while occasionally, significant differences in trait mean values were retrieved. In addition, important differences in ant species richness among biogeochemical regions were observed, as well as the identification of large areas devoid of any occurrence data illustrating the incomplete sampling of ants in the Amazon region. These results represent the first trait-based large-scale study for ground-dwelling insects in tropical forests, identifying areas of high morphological diversity, which later could be used for the identification of priority areas for biodiversity conservation in the Brazilian Amazon. (CAPES, FAPESPA)

3.3.39 EVALUATING SURROGATES FOR ANTS SPECIES IN ATLANTIC FOREST LANDSCAPES IN THE STATE OF BAHIA, BRAZIL

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Biology research focused on understanding ecological patterns and promoting conservation strategies often uses the species level as one of the main taxonomic resolutions. However, biodiversity inventories are expensive, require time, and specialists for identify species, especially in studies with hyperdiverse groups of organisms, such as ants. The use of higher taxa resolutions as substitutes for species richness may be an effective alternative to the myrmecological research at various scales. Thus, the aim of this study is to test different resolutions as effective substitutes for the species richness of leaf-litter and epigaeic ants community of 11 remnants of the Atlantic Forest landscapes in the state of Bahia, Brazil. In each site, 16 plots were collected using pitfall as well as eight Winkler traps. We measured the degree of congruence between the ant species-level data and tested subfamily, genus, indicator taxa and mixed-level as potential surrogate resolutions. We used the test Mantel to investigate the correlation between site-dissimilarity matrices calculated with species resolution, and all other resolutions. Differences in how much each surrogate matrix predicted the species matrix across the sites, measured by Mantel correlation coefficients, were tested by analysis of variance. A total of 391 ant species/morphospecies distributed in 72 genera and nine subfamilies were identified. The genera *Apterostigma*, *Camponotus*, *Crematogaster*, *Gnamptogenys*, *Neoponera*, *Pheidole*, *Pseudomyrmex*, *Solenopsis* and *Strumigenys* satisfied the criteria necessary to indicator taxa. The number of taxonomic units identified in indicator taxa and mixed-level was 180 and 243, respectively. The mixed-level, indicator taxa, and genus resolutions were considered as ‘excellent’ surrogates. The subfamily resolution presented the lowest relation with the number of ant species, not being considered a substitute alternative. When considering species composition, genus was considered as a ‘good’ surrogate; mixed-level and indicator taxa were rated as ‘excellent’ surrogates. The lowest correlation was for subfamily, which did not reach the minimum reasonable value for a species composition prediction. The Mantel correlation coefficients were statistically different according to the surrogate resolution. In the pairwise test, only mixed-level and indicator taxa resolutions were not statistically different. Our findings demonstrate that the use of substitute resolutions for ant richness, such as genus, indicator taxa or mixed-level represent an efficient alternative in the context of limited human and financial in the characterization of the myrmecofauna at landscape scale. Obtaining a good surrogate allows analyzing the biological diversity and also reducing the costs associated with accurate taxonomic analysis, or time to do so. (UESC, CAPES).

3.3.40 ANT ASSEMBLAGE STRUCTURE IN RESTORING FOREST: THE INFLUENCE OF TREE SPECIES AND SAMPLING TECHNIQUES

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Among the organisms that are found in the forest litter, ants stand out for their abundance, frequency and diversity. The litterfall is a food source and shelter for many ant species. In forests, the amount and quality of the litter should vary temporally and spatially. These variations are connected to the phenology of the different species of trees that are found in tropical forests. Sampling techniques used in the ant studies tend to be selective and may affect the diversity pattern of the assemblages. The present research had the objective to verify if the pattern of the ant assemblage diversity under different tree species used in reforested sites of Atlantic Forest is influenced by the sampling techniques. The techniques used for ant collection were the Winkler extractor and pitfall traps. Forty species in 23 ant genera were collected in a total of 40 samples of each technique. The effect of the collection technique on the species richness was marginally significant, but there were no statistically significant effects of the species or functional group of trees or significant effect of the interaction between trees and the collection technique. The composition of the ant assemblages in the samples was influenced by the tree species and the sampling technique, but there was no statistically significant interaction between the two factors. Therefore, the sampling technique had no effect on the structure pattern of the ant assemblage under different tree species. However, the association of the two sampling techniques is demonstrated adequate to evaluate the richness and the ant composition of the studied site, corroborating the literature. (CAPES)

3.3.41 DIFFERENT BURNING INTENSITIES AFFECT CAVITY COLONIZATION PATTERNS BY ANTS IN THE CANOPY OF A NEOTROPICAL SAVANNA

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Fire is an important natural disturbance in many ecosystems of the world, and some of them, such as tropical savannas, are a product of frequent fire events. Ants are responsible for a large portion of the animal biomass of tropical savannas, and are often used as biological indicators, showing fast responses to ecological disturbances. The main effects of fire on ant communities are not through direct mortality, but rather through changes in the habitat, and consequently, resource availability. A significant proportion of the ant fauna of Brazilian savannas (Cerrado) actively forage on the trees, also using them as shelter, nesting in abandoned feeding tunnels of wood-boring beetles. Here, we aimed to understand the impacts of fire on arboreal ants' usage of essential and limited shelter resources. Moreover, we also assessed the potential influence of different fire intensities under this resource use. For this, we assessed the colonization rates of experimental cavities under four different burning intensities (in order of intensity): 'control', 'against the wind', 'L-shaped', and 'circular'. We asked the following questions: a) Does fire has a significant effect on richness of ant species using experimental cavities? Is there an influence of fire intensity on this richness? b) Is there an effect of fire on arboreal ants' cavity occupation rates? Is that influenced by different fire intensities? c) are there some species of ant indicative of specific fire regimes? This study was conducted in the state of Goiás, Brazil. Twenty trees of a single tree species were selected on each of the four experimental areas. Ten cavities were wired on each tree and retrieved four months later. Our results showed a significant effect of fire on cavity utilizations by the ants. While this effect of was influenced by its intensity, with higher species richness on high intensity fire and higher cavity occupation on fire with intermediate intensity, it was consistently lower in the absence of fire. Some ant species were indicative of the distinct fire treatments, with *Cephalotes betoi* for low intensity fire or its absence, *Camponotus crassus* for medium intensity, and *Crematogaster* sp. 1 for the high intensity fire. This study is one of the few to track the importance of fire on shelter resources use by arboreal ants, coupling an experimental approach over nest site occupation and different fire intensities, providing insights for a better understanding of the effects of ecological disturbances on resource use patterns of ants. (CAPES, IBAMA/PREVFOGO).

3.3.42 FIRE AND FLOOD: HOW THE PANTANAL ANT COMMUNITIES RESPOND TO MULTIPLE DISTURBANCES ON DIFFERENT TEMPORAL SCALES

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Environmental disturbances are key components of ecological systems and can impact at different temporal and spatial scales. Many areas are affected by different disorders and the interaction between them can have null, dominant, multiplicative, additive, synergistic and antagonistic effects. In this study, we examined the effect of different disturbances (fire and flood) on the richness and composition of ant species at different temporal scales (short, medium and long term). We sampled 24 points in a floodplain of the Cuiabá River, in the Pantanal region of Poconé, State of Mato Grosso, Brazil. These points were located in areas with and without fire incidence and in flooded or non-flooded areas (defined according to altitude). The samplings were performed 10 days (short), 1 year (medium) and 5 years (long term) after the fire occurrence. Richness increased in areas disturbed by fire in the short term, regardless of flooding effect. However, in the long term, species richness was lower in areas susceptible to flooding but was not influenced by fire. In both cases, the species richness was correlated with the relative frequency (number of occurrences within each sample), suggesting that the variation in species richness was mediated by the foraging activity of the ants. The results show that the fire has a dominant effect on species richness in short and medium term, indicating that ant communities of floodplains show low fire resistance. Nevertheless, the fire effect tends to vanish over the years, evidencing that ant communities of floodplains are resilient to disturbances. (UEG, UFMT, FAPEMAT, CAPES, CNPq).

3.3.43 DO MICROCLIMATIC VARIABLES AFFECT PARAMETERS OF THE ANT COMMUNITY IN NATIVE FOREST FRAGMENTS UNDER THE INFLUENCE OF FORMICIDE BAIT?

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The interaction of organisms with their habitat involves biotic and abiotic factors and conditions. The microclimatic and environmental aspects may determine how this interaction will occur. Thus, the ant community in tropical forests is conditioned by multiple factors, and submitted to changes and impacts in the environment. One of these impacts may be the application of formicide baits in the environment, besides the alteration of the vegetation coming from the advance of cultivated areas, such as eucalyptus plantations. Our objective was to understand if the variables temperature, humidity and canopy openness influence the richness and rate of seed removal in areas with annual application of Formicidae baits (sulfluramid 0,3%). Twelve secondary forest fragments were divided into three treatments: no application of the formicide bait (SI), with the application of the formicide only into eucalyptus (IE) and application of the formicide into eucalyptus and 50 meters into native forest (IF). One transect was arranged in each area. In each transect they were marked six points with distance of zero, 20, 40, 80, 120 and 160 meters in relation to the border. We install pitfalls for 48 hours and put 50 artificial seeds and measured the temperature, humidity and canopy opening in each point. We didn't find more light in border than in center, which would result in higher temperature values and lower humidity, and consequent decrease of the richness and rate of removal. Thus, there was no effect of the baits application or their interaction between environmental variables, possibly because there is no variation of temperature, air humidity and canopy opening in the border-center direction of the native forest fragments. We conclude that seed removal rate and ant richness were not affected by temperature, air humidity and canopy opening in the border direction to the interior of secondary fragments of native forests with annual and localized application of formicide bait in this region. (Financial aid: CNPq, FAPEMIG, CENIBRA).

3.3.44 ANT ASSEMBLAGES CONSTANCY FROM FOREST TOWARDS FLOODPLAIN ECOTONES: EXPECTED TO CANOPY BUT NOT TO UNDERSTOREY HABITATS

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Ecotones between forest-water are peculiar environments due to their susceptibility to floods which are a strong environmental filter, especially for soil fauna. All the dynamics that occur in this system is fundamental for maintaining diversity, but often neglected in ecological studies. Ants, due to their sensitivity to changes in the environment, are a good model for studies in flooded ecotones. We tested the hypothesis that soil conditions in the ecotonal forests result in severe filters for the establishment of ant assemblages compared to the interior forest, while the ecotone forest canopies are as severe habitats as any upper canopy. We predicted that environmental filters generated by flooding in ecotone forests may drive ant species distribution, and forest ecotones submitted to the flood filter might have similar fauna between them, but distinct from the of adjacent interior forests. We also predicted that ant species abundance, richness and composition in ecotone canopies should be similar to those found in upper canopies of forest interior. We sampled from five sites in two biogeographic regions of a same river basin, using soil and trunk pit-fall traps. We found that ant abundance was more similar between distinct ecotones than between an ecotone and its adjacent interior forest. There were more ants in any ecotone than in the interior forest and in the rainy than dry season for the ecotones. However, we found that ant species richness was similar between ecotones and the interior of their adjacent forests. Ant fauna differed between soil and canopy in the ecotones as much as it did between forest interior soils and canopies, regardless the proximity of branches to the ground in the ecotones. Our study reveals that forest – water ecotones are not defined by one single, uniform ecological dynamic. We have found that there soil habitats are are very unpredictable for ant fauna, which means that soil environment is in process of change under disturbances, such as those driven by water flooding over seasons. On the other hand, the effects of soil unpredictability and intense temporal dynamics seem not to affect the ant species adapted to the “brought low canopy”. Additionally, our findings indicate that ecotonal canopy ant fauna distribution have exactly the expected spatial-temporal distribution, in a simple continuation from what is found in interior canopies. Ants, due to their sensitivity to changes in the environment, are a good model for studies in flooded ecotones. (CAPES, CNPQ, FAPEMIG)

3.3.45 HIGH INTENSITY FIRES HAVE STRONG EFFECTS ON THE STRUCTURE OF ARBOREAL ANT COMMUNITIES IN A NEOTROPICAL SAVANNA

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Fire is a historically important agent of disturbance in tropical savannas, and thus many species of its flora and fauna have evolved adaptations to cope with fire. However, in many places, climate change and changes in land use and land cover have increased the frequency and intensity of savanna fires well above historical levels. Ants have been frequently used as model organisms to assess the biodiversity consequences of fire disturbance. Although most studies indicate that the ground-dwelling, savanna ant fauna is resilient to the effects of fire, relatively little is known about how arboreal ants respond to fire, especially those of high-intensity. In this context, we assessed the extent to which high-intensity fires affect the structure of arboreal ant communities in a Neotropical savanna. We asked the following questions: 1) Does fire affect the species richness of ants foraging on individual trees? 2) Does fire affect the composition of species? 3) Are there any losers or winners? To answer these questions, we resampled the same focal trees (n = 162), once in 2010 and once in 2018 at a savanna reserve that suffered two severe burns, in 2014 and 2017. As a temporal control, we sampled 55 trees in another reserve, once in 2011 and 2018, where the last fire took place in 2006. We recorded a total of 81 species of ants in the burned site and 65 in the unburned. In the burned area, there was significant temporal variation in species richness (total and per tree), whereas in the control area there was not. Fire caused a decline in species richness of about 30%. Species composition was significantly different between the two sampling periods both in the burned and unburned areas. However, faunal dissimilarity was 1.27 times greater in the burned area. Among the most frequent species in our sampling, 61.5% showed significant changes in abundance over time in the burned area, as compared to only 25% in the control area. The species most negatively affected by fire (the “losers”) were *Cephalotes pusillus*, *Pseudomyrmex gracilis* and *Tapinoma* sp., whereas *Camponotus melanoticus*, *Brachymyrmex* sp. and *Solenopsis* sp. seem to be favored by fire. Overall, our results show that high-intensity fires cause significant changes in the structure of the arboreal ant community. (UFU, CAPES, NSF)

3.3.46 FREQUENCY OF ANT-PLANT INTERACTIONS IN DIFFERENT TYPES OF FARMING IN THE SOUTH OF RIO GRANDE DO SUL, BRAZIL

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The rise of organic farming around the world as an alternative to conventional production systems, is an opportunity to study the effects of conventional agriculture (and its effects on fragmentation and deforestation) on biodiversity, ecological interactions and ecosystem services. For instance, the agroforestry system, which consists of polyculture in the midst of native plants, has the potential to maintain ecological interactions in organic farming. Arboreal ants are organisms commonly associated with various ecosystem services in agroecosystems such as predation of pests, pollination and seed dispersal. In addition, because many of them are sensitive to changes in habitat, they are a great study organism to verify how the different agricultural practices affects the biodiversity and the ecological interactions. We thus asked two questions: (i) is the agroforestry system effective in maintaining ant-plant interactions? And (ii) are the community of arboreal ants different between conventional and organic systems? To answer these questions, we sampled six rural properties located in Canguçu and Morro Redondo municipalities (Brazil, Rio Grande do Sul), being three organic properties with the presence of agroforestry and three conventional ones. We established three transects with 6 pitfall traps (adapted for arboreal sampling) each with attractive baits on forest fragments inside each property and 6 more in the agroforestry of the organic properties. In addition, we performed direct observations on 10 randomly selected plants in the same transect, observing for 4 minutes each. We obtained 3.812 ants, being 2386 in pitfall traps and 1426 in observations. We found 1864 individuals in agroforests, 843 in organic forests and 1105 in conventional forests. Individuals are being identified for better analyzes of richness and composition. We registered a total of 40 (4.4 ± 2.1 interactions/transect) interactions in the organic forest, 57 (5.1 ± 2.2 interactions/transect) in the conventional and 68 (7.5 ± 2.5 interactions/transect) in the agroforestry. Our results show that agroforestry represents a great tool to maintain ant and plant interactions, being very important for the maintenance of biodiversity and ecosystem services. The abundance and the mean morphotype per transect between the conventional and organic forests were similar. We presume that because the properties are very small, ant diversity may be affected by disturbances at the landscape level in both types. The present study is important to provide data on biodiversity patterns of ants in pampas regions and to give visibility to practices of organic agriculture that prove to be very effective. (UFPEL, FAPERGS)

3.3.47 ARE PATTERNS OF CO-OCCURRENCE IN LEAF-LITTER ANTS COMMUNITIES DIFFERENT ACCORDING ENVIRONMENTAL COMPLEXITY?

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Changes in land use can affect the way the species interact. Some disturbances may increase the severity of environmental filters and result in the co-occurrence of species with similar ecological attributes. On the other hand, the absence of species co-occurrence may result from competitive interactions or preference for divergent habitats. In this study, we evaluated the role of resource heterogeneity in co-occurrence patterns of ant communities in areas with different land uses (pasture, cocoa agroforestry and Atlantic forest). We hypothesized that in areas with simplified habitats such as pasture, ant species will have similar ecological requirements, resulting in a low number of occurrences of negative interactions. In contrast, sites with greater heterogeneity of resources (“cabruca” cocoa plantations and forest remnants) will be structured firstly in mosaics, resulting from competitive interactions or preference for divergent habitats. The study was carried out in 39 localities (13 areas per treatment) in the southern region of the state of Bahia, Brazil. In total, 50 leaf litter samples of 1m² were collected per site, and the ant fauna was extracted with mini-Winkler apparatus. We used probabilistic models of expected species co-occurrence patterns and species pairwise co-occurrences. In addition, we used Kruskal-Wallis and Dunn’s test to compare the amount of negative interactions between pasture, cacao and Atlantic forest. We recorded a total of 305 species of ants in the whole experiment, belonging to 66 genera and nine subfamilies. 236 ant species were sampled in the forest remnants, 211 in cocoa and 152 species in pasture. We found patterns consistent with our hypothesis. Cocoa and forests remnants had higher mean negative interactions than pastures, and 20.7% of species in forest remnants showed negative interactions, 26.6% in cocoa and 9.8% in pasture areas. We observed that the pairwise interactions vary according to land use. The species responsible for most of negative interactions respectively in areas of cacao, pasture and forest were *Wasmannia aurunpuctata* (Roger, 1863), *Crematogaster carena* (Mayr, 1862) and *Solenopsis* sp.1. All of them showed a similar co-occurrence pattern. Our results suggest that habitat simplification has a strong influence on the distribution of ants in altered habitats as well as in preserved areas, and the competitive interactions play important role in structuring the ant communities. Finally, we highlight how land use can drastically change pairwise interactions in ants.

3.3.48 ANTS OF ESPIRITO SANTO'S MANGROVES: A PIONEER STUDY

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Mangrove ecosystem is an extreme and unique environment presents a several of microhabitats and available resources that can be used by ant communities. In general, ant communities respond to plant complexity, with an increasing in abundance and ant species richness with higher plant heterogeneity. It is expected that this pattern also occurs in mangroves, since there are monospecific forests with only one plant species, until others with up to 10 different plant species, constituting a mixed forest. Studies about mangroves ant fauna are scarce around the world, and in Brazil it is the first work conducted in Espirito Santo mangroves about ant communities. So, the goal of this study is to investigate which ant species visit the species of trees in two types of mangrove forests (mixed and monospecific) in the northern of Espirito Santo province. Also, to test the assumption that there is a higher species richness in mixed mangroves than in monospecific ones. The study was conducted in Barra Nova E.S, São Mateus district. The ants were sampled using pitfalls without bait traps, and in each forest five parcels with 10m x 10m of area were delimited. Nineteen ant morphospecies were sampled, distributed in 12 genera and four subfamilies. The most diverse subfamily was Myrmicinae, represented by seven genera and eight species (*Cephalotes grandinosus*, *Monomorium floricola*, *Nesomyrmex* sp.1, *Pheidole* sp.1, *Pheidole* sp.2, *Procryptocerus* sp.1, *Solenopsis* sp.1, *Xenomyrmex* ufv-02) followed by Formicinae, with two genera and five species (*Camponotus arboreus*, *Camponotus* sp.1, *Camponotus* sp.2, *Camponotus atriceps*, *Paratrechina longicornis*), Pseudomyrmicinae, with one genus (*Pseudomyrmex*) and four species, and Dolichoderinae, two genera and two species (*Azteca* sp.1, *Dolichoderus lutosus*). Contrary to the expected no differences were found between ant species richness in mixed and monospecific. The diversity of ants sampled was quite close to registred in other studies on mangroves in Brazil and in the world. No endemic species of this ecosystem were recorded, however, the record of *Cephalotes grandinosus* deserves attention, being the first to the Espirito Santo. In addition, the rare genus *Xenomyrmex* had in this study its first record for a mangrove environment in Brazil. This was the first study to inventory the ants assemblages of the mangrove ecosystem in Espirito Santo province, and in general, we emphasize that there are still several gaps to be filled and several ecological patterns and processes to be investigated. (UFES).

3.3.49 WHAT IS THE BEST METHOD FROM PROTOCOL ALL TO SAMPLE ANTS AND GUILDS IN A TROPICAL RAIN FOREST?

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The "ALL" protocol standardizes two methods (pitfall and Winkler) for sampling at least 70% of the epigeic ants and can be used in any environment making it a fundamental tool in ant community studies around the world. The search for effective methods and cost reduction in scientific research has grown around the world due to the financial crisis in some countries. The aim was to verify the best method (pitfall or Winkler) for sampling ants and their respective trophic guilds in a tropical rain forest. The study was carried out at the National Forest Conservation Unit of Tapirapé-Aquiri - FLONATA (5°35 'and 6°00' S and 50°24 'and 51°06' W). The ants were collected in pitfalls and Winklers extractors based on the ALL protocol. In total, 1883 specimens of ants, belonging to 6 subfamilies, were collected with 138 species. The pitfall sampled 478 specimens belonging to 6 subfamilies with 47 species and 7 trophic guild. The most richness subfamilies were Myrmicinae (32 species), Formicinae (9 species) and Dolichoderinae (3 species). The most abundant species were *Pheidole* sp2 (25,31%), *Camponotus* sp6 (12,34%) and *Eciton* sp1 (8,58%). And the most abundant guilds were omnivorous generalist (79.10%), terrestrial generalist predator (10.02%) and omnivorous arboreal (5.33%). The Winkler extractor collected 1350 ants belonging to 5 subfamilies, 105 species and 7 trophic guilds. The three most richness subfamilies were Myrmicinae (81 species), Formicinae (11 species) and Ectatomminae (7 species). The most abundant species were *Washnnia* sp1 (19.79%), *Dolichoderus* sp3 (8.26%) and *Pheidole* sp16 (6.52%). And the most abundant guilds were omnivorous generalist (60.45%), terrestrial omnivore (11.02%) and terrestrial specialist predator (9.74%). The species composition among the methods had a 12% similarity. Winkler collected an average of 3 times more ants (and trophic guilds) than pitfall. For species richness and trophic guilds Winkler recorded 2.4 and 1.8 (respectively) times more than pitfall. This results shows that the Winkler extractor is the best method (isolated from the ALL protocol) for tropical rain forests. Knowing that tropical rain forests present a high density of litter and that maintains a high richness of ants (and other organisms). Allied to this the Winkler extractor does not collect only foraging ants (e.g. pitfall) as well as the ants build their nests in the litter (i.g. twigs, leaves, below small rocks). Thus the Winkler extractor is ideal for environments with high density of litter.

3.3.50 ENVIRONMENTAL COMPLEXITY IN RELATION TO A COMMUNITY OF EPIGEIC ANTS IN A TROPICAL RAIN FOREST

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Environmental complexity is related to the availability of niches, which establishes resources and conditions to maintain greater quantity of species. Most studies report a positive relationship to species richness and abundance and environmental complexity. The aim of this study was to analyze the abundance and richness of epigeic ants in relation to the environmental complexity of a tropical rain forest. The study was carried out at the National Forest Conservation Unit of Tapirapé-Aquiri - FLONATA (5°35' and 6°00' S and 50°24' and 51°06' W). The ants were collected using the Ants of the leaf litter (ALL) protocol. For analysis of the environmental complexity, five vegetation parameters were used: (1) LAI (leaf area index) total of leaf area per surface area of land; (2) LAI_e (effective leaf area index) corrected by Clumping index; (3) Canopy cover, percentage of vertical canopy cover; (4) Crown porosity, percentage of gaps within the image, which may relate to the penetration of light through the canopy; and (5) clumping index, measure of randomization of leaf distribution. For the effect of the parameters on the ant composition species we perform a CCA (Canonical Correspondence Analysis). The environmental complexity index was generated from the most significant axis of PCA (Principal Component Analysis). Relative richness and abundance were related to the parameters and the environmental complexity index using GLMM (Generalized linear mixed model). In total, 1883 specimens of ants, belonging to 6 subfamilies and 138 species were collected. The most representative subfamilies were Myrmicinae (101 species), Formicinae (18 species), Dolichoderinae and Ectatomminae (7 species). The most frequent species were *Wasmannia* sp1 (14,76%), *Dolichoderus* sp3 (8,52%) and *Pheidole* sp2 (6,64%). No effect of vegetative parameters and complexity index was found for richness and abundance of ants. The environmental parameter that had the greatest influence on the ant community was the LAI_e (75%) having an effect on 13 species of ants. In this study, environmental complexity and vegetation parameters (showed low variance between parameters and points collected) had no effect on the abundance and richness of ants, possibly due to FLONATA being considered one of the well preserved forest (reached the climax) representatives in Southeastern Pará, Brazil. We suggest in future research, to verify the effect of environmental complexity on abundance and richness of ants to use soil and litter level parameters and thus assist in environmental management and conservation programs.

3.3.51 THE RELATIONSHIP BETWEEN MORPHOLOGY OF THE SUBTERRANEAN ANT FAUNA AND CHEMICAL ATTRIBUTES OF SOIL

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Soil is a complex environment rich in habitats for a vast underground diversity of life forms. Ants are an important component of soil communities acting on ecological processes and ecosystem services. Morphological traits can be used to reveal relationships between the environment and the ecology organisms. The aim of this study was to test the relationship between morphology of subterranean ants and chemical attributes of soil. To reach this, three data sets were constructed: i) chemical properties of soil (pH, carbon, organic matter, nitrogen, aluminum, sodium, phosphorus and potassium), ii) occurrence of ant assemblages, and iii) ant morphological traits. Soil samples in two soil depths (0-15 cm and 16-30 cm) were taken in two sites of *terra firme* forest fragments in Eastern Amazonian (two 200 m transects and 20 samples in each site). A total of eight subfamilies, 24 genera and 48 species were recorded. Myrmicinae showed the highest species richness (27 species), followed by Ectatomminae (seven), Ponerinae (seven) and Formicinae (three), Amblyoponinae, Dolichoderinae, Dorylinae and Proceratiinae were represented by one species each. Ant richness and ant morphology were better explained by some chemical elements in soil, such as sodium and phosphorus, as well as the content of soil organic matter. Eye size and mandible size decreased with increasing organic matter, shaping ant assemblages characterized by (i) small-sized predator species and (ii) an apparent trend in reduction of morphological characteristics. Our results can be used as guidelines for future studies about morphological diversity and their relation to Amazonian ecosystems and, in particular, for ants inhabiting the underground – called the last frontier in ant biodiversity research. (PPGCS, UFSM, CNPq, CAPES)

3.3.52 BIOGEOGRAPHIC REGIONALIZATION OF THE NEOTROPICAL SAVANNA ANT FAUNA

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Anthropic impacts are at an unprecedented pace, with natural habitat conversion and climate change increasing the threat of local and global species extinctions. Urgent conservation efforts are thus needed to curb the biodiversity crisis. However, we still lack knowledge on the distribution of species in biodiverse tropical regions, which is essential to guide decision making. This is especially concerning for invertebrates, which are historically neglected in guiding conservation priorities, despite their high diversity and ecological importance. We aimed to delineate biogeographic regions in the Brazilian Cerrado – a Neotropical savanna ecoregion with global conservation priority – based on species composition of the ant fauna. We used georeferenced occurrence records to construct species distribution models (SDMs) with the Maxent algorithm, using 19 bioclimatic variables as predictors. SDM returns a map of habitat suitability for each species, which may be converted to binary (presence/absence) maps using a threshold value (unique for each modelled species). We then generated random points within the region to extract information about the potential occurrence of each ant species. We calculated pairwise Simpson dissimilarities, resulting in a matrix of compositional distances between points. We then used partitioning around medoids algorithm to assign each point into a cluster (number defined by the elbow method). The points were plotted in geographic space, thus delineating biogeographic regions in the Cerrado. Moreover, based on standardized samplings within the region, we used IndVal to test which ant species may indicate the region of occurrence. Based on SDMs of 224 ant species we were able to delineate five biogeographic regions within the Cerrado; these were: i) the Northern; ii) North-western; iii) Central; iv) South-eastern; and v) South-western regions. Among the species with significant indication potential, ten had indicator values higher than 0.5, including: *Dinoponera gigantea*, *Nesomyrmex schwebeli* and *Solenopsis* sp. 07 (Northern region); *Trachymyrmex* sp11, *Sericomyrmex scrobifer* and *Neivamyrmex* sp. 08 (North-western); *Camponotus* sp. 52 (South-eastern); and *Pheidole susanae*, *Linepithema aztecoides* and *Solenopsis* sp.23 (South-western). Our results have important implications to the conservation of Cerrado savannas. Previous studies show higher ant diversity in the southern and central Cerrado, which are also the most impacted regions. Despite the existence of large stretches of pristine vegetation in northern Cerrado, land conversion is fast at these regions. Our results highlight the importance of creating an ecoregion-wide network of protected areas so to comprehensively conserve Cerrado ant diversity. (UFU; CAPES)

3.3.53 EFFECT OF FOREST COVER AT THE LANDSCAPE LEVEL ON THE TAXONOMIC AND FUNCTIONAL BETA DIVERSITY OF ANT ASSEMBLIES IN THE SOUTHWEST OF THE BRAZILIAN AMAZON

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Landscapes with little forest cover besides harbor a small biodiversity are made up by species tolerant to anthropic disturbances. This has led to expressive differences on taxonomic and functional composition of ant assemblages of natural habitats and human-land systems. The additive partitioning of beta diversity on its replacement and gain/loss species component have provided useful advances on the understanding about composition simplification in ant assemblages in human-modified landscapes. Thus, we investigated the response of the taxonomic and functional beta diversity of ant assemblages, in relation to a forest cover gradient at landscape level in southwestern Brazilian Amazon. We expected that the increasing of taxonomic and functional beta diversity should be promoted by the increasing of species replacement component. We carried out the ant sampling in Chico Mendes Extractive Reserve, Assis Brazil, AC along 12 circular plots ($r = 500$ m, $\text{area} = 785,000 \text{ m}^2$), 5 km apart from each other. In each plot, we installed 16 pitfall traps, distributed in four transects disposed in each radial of the plots. Additionally, we quantified the percentage of forest cover in each plot from satellites images. Then, we compared the ant assemblage of all plot with one in the plot with the lowest forest cover (13%) to obtain taxonomic and functional beta diversity and their components of replacement and gain/loss species. As we expected, increasing the forest cover of the plots higher was the taxonomic and functional beta diversity in relation to the ant assemblage in the plot with the lowest forest cover. The increasing of taxonomic and functional beta diversity was promoted by species replacement component. Our results support the importance of maintaining the forest cover for the conservation of species, as well as the diversity of morphological features that are present in areas with high forest cover, and then, when reducing forest areas, it must generate landscapes with a very simplified fauna in taxonomic and functional terms revealing the importance of the maintenance of preserved areas to maintain the variability of species and functional traits. (CAPES, PEER/NSF – USAID, FAPAC).

3.3.54 ANTS COMMUNITIES IN PLANTS OF RESTINGA: UNDERSTANDING THESE RELATIONS

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Restinga is an ecosystem with high environmental stress due high rates of salinity and sunlight incidence. Although ants are abundant in this inhospitable environment, they have been poorly studied in Restinga, especially when considered ant-plant interactions. We aimed to investigate the richness and composition of ants interacting with plants by different phytophysiognomies of Restinga, testing the hypothesis: (i) different ant species present the highest frequency of interaction within EFN-plants networks comparing different Restinga phytophysiognomies; (ii) plants found in the Restinga forest interact more frequently with ants than plants of open Restinga; (iii) ants perform a higher number of interactions with plants bearing EFNs than plants without this food resource. To test them, we established 20 plots of 20x20m; ten located in each phytophysiognomy: open restinga and restinga forest. We collected samples of all woody plants within each plot, and pitfall traps and beat technique were performed for sampling ants. Results showed a higher number of established links between ants and plants in the restinga forest when compared to open restinga, as expected. Overall, we sampled a total of 274 plants belonging to 49 species of 28 angiosperms families. The richest families were Myrtaceae (eight species) and Fabaceae (six species), where as the most representative family was Burseraceae with *Protium spp* of total sampled (23%). We recorded a total of 27 ant species from six different subfamilies, where in Myrmicinae was the most representative (12 species). We observed a higher number of interactions between ants and plants without EFNs compared to plants with EFNs. We found that ant species richness on trees without EFNs was significantly higher than on those bearing EFNs, and bears the highest ant species richness in plants without EFNs. There were smaller number of links with plants in the open restinga than in the restinga forest however; plants with EFNs presented, proportionally, a larger number of connections. (UFES/CEUNES, LabSEI, SGV, CAPES)

3.3.55 INFLUENCE OF ANTHROPOGENIC DISTURBANCE ON THE COEXISTENCE OF ANTS

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The understanding of the occurrence of some species in anthropic environments can provide information that helps the understanding of the invasion of non-native species. The objective of this study was to verify the conversion of a natural environment to pasture area and its effect on the coexistence of ants, and the effect of seasonality. The study was carried out in two areas near the Federal University of Southern and Southeastern Pará, Marabá - PA, area (1) corresponds to a riparian forest and area (2) converted into pasture. The ants were sampled in the dry and wet seasons in both environments. Transect was set up containing five points of collection with baits (crushed peanut candy with honey, crushed peanut candy and a piec of compacted crushed candy) distant 20 meters from each other. We found a total of 12 genera in the riparian forest area, five in the pasture area, with the genera *Ectatomma* and *Tapinoma* common in both areas. The predominant species in the riparian forest was *Ectatomma* sp2 (11%), while in the pasture area it was *Solenopsis invicta* (24%). In general the area of greatest richness was riparian forest (3.9 ± 2.08 , mean \pm SD) in relation to pasture (2.3 ± 1.9). We did not find the effect of seasonality on richness in the riparian forest (dry season = 5 ± 1 , wet season = 3.5 ± 2.08), but for pasture area the richness was almost three times higher in the wet season (3.8 ± 1.30) than in the dry season (1.3 ± 0.57). Probably the dominance of *S. invicta* in pasture areas is causing a lower species richness of ants in these environments due to aggressive behavior the high rate of recruitment in the alimentary resources of *S. invicta*. In riparian forest *S. invicta* is absent, with the most frequent ant being *Ectatomma* sp2 and greater coexistence of different ant species. Increased occurrence of *S. invicta* causes reduction of arthropod diversity, indirect damage to plants, affects other species of ants due to the great efficiency in exploiting resources. *S. invicta* population has a greater capacity to expand in anthropic area, which makes this species with high potential for invasion and allied to this the anthropic disturbances result in the reduction of habitat, homogenization of the ant community that can lead to a reduction of ant services. (UNIFESSPA, Fapespa).

3.3.56 EFFECT OF ENVIRONMENTAL HETEROGENEITY ON THE COEXISTENCE OF FUNCTIONAL GROUPS OF ANTS.

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The competition is defined as any use or defence of a resource by an individual that reduces their availability to other individuals. The coexistence among ants can be influenced for competition and factors as anthropogenic disturbance and seasonality. In this context our investigated the coexistence of functional groups of ants in two areas: (1) a heterogeneous, characterized by a riparian forest and a (2) homogenous riparian forest converted to pasture. This study was carried out close to Universidade Federal do Sul e Sudeste do Pará – Campus III, Marabá – PA. We collected in dry season (November) and wet season (January). For each area, a transect was set up with five stations, each one with baits (slice of peanut candy compacted, peanut candy crushed and peanut candy crushed with honey). The ants were identified in functional groups based in their response behaviour for stressed environmental at global level. The more frequent functional group in heterogeneous area was Specialist Predator (SP) (22%), whereas in homogenous area was Warm Climate Dominant (WCD) (26%) with 6.5 more occurrence in homogeneous area than heterogeneous area. In heterogeneous area during dry season, the frequent group was SP and Generalist (G), however in wet season there was no groups dominant. In relation to homogenous area during dry season, there was no dominance of functional groups however in wet season SP and WCD groups dominated. The SP group is considered a bioindicator of preserved area. SP group is present in areas with high density of shadow tolerance species due a larger abundance of prey. How expected, WCD group has ample occurrence in homogenous area due a high temperature and your biology is adapted to warm climate environment. There was no dominance, in this area in dry season, what makes this period more severe to functional groups of ants. However, WCD group had more occurrences during wet season and allowed the SP group coexist. The heterogeneous area had ample coexistence of functional groups compared to homogenous. The dominance of WCD at homogenous area is concern, because your presence is not allowing the coexistence of others functional groups. (UNIFESSPA, Fapespa)

3.3.57 HYBRID MODELS ARE BETTER TO PREDICT SPECIES RICHNESS OF ANTS IN FRAGMENTED LANDSCAPES

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Deforestation and the consequent forest fragmentation are factors that threaten biodiversity in terrestrial ecosystems. The size of the fragments, their isolation, the available resources within fragments, such as tree density, and bioclimatic conditions can influence species richness. As many factors can potentially influence, directly and indirectly, species richness and composition in fragments, it is important to understand which variables are more important to explain biodiversity distribution patterns. Ants are abundant, easy to collect and are indicated for studies about the processes influencing species diversity. Thus, our study aimed to understand how diversity and composition of ants are influenced by environmental variables in a fragmented landscape in the Atlantic forest biome. Our study area is located in the Paraíba River Valley (Southeast Brazil), with a long history of environmental degradation due to the use of the land for agriculture. We selected 30 forest fragments in three different regions for ant sampling. Within each fragment, 20 samples of 1 m² litter were submitted to Winkler extractor for 48h. We tested pure generalized linear models (GLM) with landscape variables (area and isolation degrees), internal conditions of the fragments (tree density, shrub density, litter depth and soil cover) and bioclimatic variables. We also tested hybrid GLMs with variables that best explained the data in the three previous pure models. We applied these models for total richness and richness of the functional groups of ants (cryptic predators, epigeic predators, cryptic omnivores, epigeic omnivores, opportunists and Attini). In addition, we analyzed the composition using variables of the best model for total species richness. We recorded 168 ant species. The most frequent species were *Hypoponera distinguenda* (Emery, 1890), *Solenopsis* sp6, *Wasmannia* sp2, and *Strumigenys denticulata* Mayr, 1887. The hybrid model, with fragment area, isolation degree, tree density, shrub density and mean annual air temperature was the best model predicting total species richness in the forest fragments. Functional groups richness was little explained by the proposed models, with exception of Attini, which was influenced by soil cover, depth of litter, mean annual air temperature and annual precipitation. Species composition was affected by tree density and mean annual air temperature. Our results suggest that the total species richness is influenced by a set of factors that involves landscape structure, internal conditions of the forest fragments and bioclimatic variables. (FAPERJ)

3.3.58 ASSOCIATION BETWEEN BIOLOGICAL SOIL CRUSTS AND LEAF-CUTTING ANTS IN A SEASONALITY TROPICAL DRY FOREST: IMPLICATIONS FOR A NATURAL REGENERATION OF THE CAATINGA

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Leaf-cutting ants (LCA) influence different levels of biological organization, from plant individual to the entire ecosystem, mainly by herbivory and soil modifications. In the same way, biological soil crusts (BSC) affect seed germination and seedling establishment via its role in the soil creation and nutrient enrichments. By strongly influencing soil characteristics, both leaf-cutting ants and biological soil crust have the potential to affect natural regeneration. Although the individual role of LCA and BSC modifying soil be known, the association of these two key organism and their implications for natural regeneration still needs be investigated. The aim of this study was investigate the associations between BSC and nests of *Atta opaciceps* in areas of Caatinga. The study was carried out in the Catimbau National Park, Buíque - PE (8° 30' 57" S, 37° 20' 59" W), where 50 nests of *Atta opaciceps* (30 actives and 20 inactives) were selected. We recorded 15 BSC organisms divided into 4 functional groups: lichens (7 organisms), algae (4), cyanobacteria and bryophytes (2 each). We found a strong association between BSC and inactive nests in relation to active nests and control areas. BSC showed high coverage per unit of inactive nest soil with predominance of the green algae group (intermediate group during soil formation). This BSC group, depending on the degree of soil cover and activity, can add a reasonable amount of nutrients to the soil, particularly via carbon and nitrogen, mainly by the acquisition of atmospheric nitrogen. This association may aid in the formation of more fertile soils starting inactive nests, as they remain with low concentrations of nutrients compared to adjacent forest areas. Active nests showed low BSC coverage, mainly due to the constant activity of the maintenance and expansion of the nests, so the ants overwhelm the BSC stopping their development. The main BSC in active nests was cyanobacteria (pioneer group during soil formation). In control areas we found all stages of soil formation, from cyanobacterias to lichens and bryophytes, the most advanced groups during the succession. Our results indicate a strong association between BSC and inactive nests, which may increase the soil fertility in these areas, favoring the dynamics of natural regeneration. However, the decreasing of these associations in active nests highlights the negative effects of LCA, which together with its role of herbivore and its favoring in disturbed areas could jeopardize the process of regeneration in Caatinga. (CNPq, FACEPE)

3.3.59 INFLUENCE OF LEAF-CUTTING ANTS ON SOIL HYDRAULIC PROPERTIES IN A SEASONALLY TROPICAL DRY FOREST

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Although Seasonally dry tropical forests (STDFs) are one of the most threatened ecosystems around the globe with anthropogenic disturbance leading to the loss of hydraulic functions, there are few studies about ecohydrological aspects of these ecosystems. Leaf-cutting ants are an example of group that proliferate in disturbed environments of STDFs and they are commonly known by alter soil properties (structure, texture and fertility) where they build their nests. Our studies focused on the modifications of soil water infiltration caused by *Atta opaciceps* nests in the Caatinga dry forest. The study was developed in the Catimbau National Park, Buíque – PE (8° 30' 57" S, 37° 20' 59" O). We selected fifteen nests and performed infiltration tests in the following treatments: active mound, inactive mound, inactive mound with biological soil crust (BSC), external refuse dumps (refuse) and control area (i.e. area without nests influence). We used the Beerkan method that corresponds to the simulation of a rain event to determine the hydraulic properties: accumulated water depths, infiltration curve, water field capacity and steady-state infiltration. The infiltration time of water depth (113.18 mm, rainfall) was different between treatments with active mound showing an infiltration time of 3176 s, BSC 2861 s, inactive mound 1925 s, refuse 336 s and control area 720 s. The infiltration curve started to stabilize in the active mound from 2381 s, in BSC 2646 s, inactive mound 1650 s, control area 678 s, while the refuse's infiltration time did not reach the stability (supporting a greater intensity of rain). In relation to the field capacity, no difference was observed between treatments, the average was 27.81 gH₂O. After soil saturation by rainfall event, the refuse, BSC and control had the faster infiltration times recorded (mean \pm SD: 809.57 s \pm 663.49). The active mound were 4.5 times slower at infiltration time. However, there was no difference between inactive mound and the others treatments. A faster infiltration is related to reduce soil runoff, degradation and greater probability of water percolation in the soil. Together with information that refuse is considered islands of fertility in relation to control areas and another parts of the nests. These results suggest that refuse of *A. opaciceps* in relative to the hydraulic components correspond to an ideal environment for the establishment of plants which can have important implications for STDFs where water availability is an important limiting factor. (CNPq, FACEPE)

3.3.60 USE OF A SINGLE SAMPLING METHOD CAN HALVE ANT SPECIES RICHNESS IN A RIPARIAN FOREST IN THE EASTERN AMAZON

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Ants are considered functional bioindicators by their sensitivity to changes in terrestrial environments, also being used to characterize the stages of plant restoration in riparian forests. This study aims to analyze the composition of ant species in a riparian forest in regeneration process in the Amazon region, Brazil, by using different sampling methods. We sampled in the countryside from the city of Imperatriz - Maranhão (5°29'38"S, 47° 23'45"W), with typical vegetation of alluvial semideciduous seasonal forest and pasture. The sampling was made in the banks of the Cacao river, in April 2019, during the rainy season. The traps were installed in five quadrants (5 m x 5 m), 50 meters away from each other. In each quadrant, there were three pitfalls with water, two pitfalls with urine and two arboreal traps with urine. During pitfalls installation, we have done 20 minutes of active search, in a 10 meters radius of the sampling points. We recorded 55 species belonging to 28 genera and 7 subfamilies. The subfamily Myrmicinae presented the greatest number of records (28 species), followed by Ponerinae (8), Formicinae (7), Ectatomminae (5), Dolichoderinae (4), Dorylinae (2) and Pseudomyrmicinae (1). Four new species were recorded to Maranhão: *Gnamptogenys tortuolosa*, *Hylomyrma reitteri*, *Myrmicocrypta* sp. and *Xenomyrmex* sp. We found 22 species in a single sampling point, while 8 species occurred in 4 different methods. The method that recorded the largest number of species was the pitfall with water (28), followed by active search (27) and pitfall with urine (25). *Xenomyrmex* was found in ground trap, it may be an accidental record since this specie inhabit trees. The active search had the greatest records of exclusive species (9), while the arboreal traps resulted in none. In this rapid inventory, we found a higher number of species than the studies carried out in a single area in the Amazon region of Maranhão State, probably due to the use of many different sampling methods. The greater distance between the sampling points may also have contributed to the species richness, allowing inventory in a greater range of habitats. These results corroborate the necessity of using several sampling methods in a broader environmental gradient, to better analyze the composition of ant species in the Amazon. (UFMA)

3.3.61 DIVERSITY OF ANT SPECIES (HYMENOPTERA: FORMICIDAE) IN URBAN AREAS OF THE STATE OF TOCANTINS, BRAZIL, WITH NEW RECORD OF *LEPTOMYRMEX RELICTUS* BOUDINOT ET AL.

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Ants play an important role in the energy and biomass flow and in the evolution of communities. Studies with ants in the state of Tocantins are still limited to a few studies carried out in a hospital environment and in Cerrado. The aim of this inventory is to identify the ant species in urban fragments in order to promote the study of the local myrmecofauna with larger sampling and long duration studies. We collected data from four localities in the municipality of Palmas and one locality in Nova Olinda, state of Tocantins, during the rainy season in January 2019. In each locality sampling was carried out for two to three hours in the morning and/or evening. All the ants were collected with tweezers and conditioned in tubes with 90% alcohol. We recorded 57 species belonging to 7 subfamilies and 25 genera. The subfamily Myrmicinae presented the highest number of records (15), followed by Formicinae (12), Dolichoderinae (8), Ponerinae (8), Pseudomyrmicinae (7), Ectatomminae (5) and Dorylinae (2). The two individuals of the species *Leptomyrmex relictus* Boudinot et al., 2016, the only newly described species of the genus in Brazil, were found in the Cesamar Park, in Palmas. The results of this work allowed the record of 43 new species for Tocantins, surpassing work already done in a hospital setting (12 species) and in a Cerrado area (36 species). The new records of this work for the state (104 species) still do not represent half the number of species in bordering states, such as Goiás (388 species), Mato Grosso (453), Bahia (563) and Pará (598). The ants diversity between areas indicates that a higher species richness than that recorded should be expected with the use of other sampling methods and in different climatic periods. The record of the species *L. relictus* is about 35 km from the last record of this species, in the municipality of Porto Nacional in Tocantins. Its presence in an urban fragment, with a great flow of people, suggests that it supports anthropic alterations in its habitat. These initial results evidenced the need to increase the sampling effort on the myrmecofauna in the state of Tocantins, to increase the knowledge of this group in the Cerrado and thus to understand the existing ecosystem processes. (CAPES, FAPEMA)

3.3.62 SEASONAL COMPOSITION OF ANT SPECIES IN URBAN FRAGMENT IN THE EASTERN AMAZON

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In urban fragments, ants stand out from other organisms for their diversity and ecological functions. The number of papers sampling the myrmecofauna in the state of Maranhão is still low compared to other Brazilian states. In order to increase understanding of this group in the state, this work evaluates the local distribution and the temporal variation of the ants in an urban fragment of Amazon forest. The present study was carried out in the forest reserve of the do 50º Batalhão de Infantaria de Selva (50º BIS), located in the city of Imperatriz, Maranhão (5° 30' 37" S 47° 28' 47" W). Three samplings were carried out in March, July and October of 2015, covering the wet and dry seasons, in a sampling grid of 36 points, 30m apart, totaling 108 samples per collection and 324 samples in all. Pitfall traps, attractive baits of sardines and guava slices were used for the collections. The pitfalls were installed at ground level and were arranged for 48 hours. The exposure time of the baits was approximately two hours at each of the sample points. Our results include the record of 67 species of ants, belonging to six subfamilies and 30 genera, of which 37 species were recorded for the first time in the state of Maranhão. The subfamily Myrmicinae presented the highest number of records (306), followed by Ponerinae (87), Formicinae (81), Ectatomminae (40), Dolichoderinae (19), and Pseudomyrmicinae (1). The species *Pachycondyla crassinoda* (Latreille, 1802) (58 occurrences), *Atta opaciceps* Borgmeier, 1939 (41) and *Solenopsis* sp. 1 (37) were the most frequent in the samples. Pitfall was the trap that resulted in a higher number of recorded species (53). However, this method was the one that presented the greatest reduction in the number of species in the third collection (dry season), in which less than half of the species of the previous month were recorded. While the baits recorded a greater number of exclusive species (12). Similarity analyzes showed a greater variation in species composition between trap types than among sampling months. The number of ant species (67) collected in this study was higher than the other studies in urban fragments in Brazil, suggesting the need to use more than one capture method in the inventories, as well as the collection in more than one climatic period in order to have a better understanding of local diversity. (CAPES, FAPEMA)

3.3.63 ACRE AND ITS CONTRIBUTION TO ANT BIODIVERSITY

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Knowledge about biodiversity has been singled out as one of humanity's greatest challenges, as changes in the patterns of use of aquatic and terrestrial ecosystems have led to an accelerated loss of species especially in the tropical region. However, this knowledge about Amazonian biodiversity is not uniform among the states that constitute the Legal Amazon. Bioindicators have been used to evaluate the impacts of biodiversity on landscapes under anthropic pressure. Easy sampling, well established taxonomy and sensitivity to ecological and environmental changes are desirable characteristics for a group of organisms to be considered a bioindicator. The ants, besides contemplating all these, are megadiverse and are involved in several ecosystemic functions. The objective of this study was to perform a sampling of the biodiversity of ants in the state of Acre, where the number and composition of genera were verified along three river basins of the state. The specimens of ants used come from three collection sites: Acre river basins, Juruá river and Purus river. The collection sites include three portions within each basin, high, medium and low portion. At each collection site, ten plots of 25 m² were established along a transect of 200 m in length. In each plot a pitfall fall trap was installed in the following strata: soil surface, trunk of trees and subsoil, and a sample of 1 m² of litter was collected. The ants present in the litter sample were collected through the mini-Winkler extractor. The traps remained in the field for 48 hours, and the extractor used the same time. Subsequently, the specimens were taken to the laboratory for identification at the gender level. In all, 61 genera of ants distributed in 10 subfamilies were collected in all collection areas. The number of ant genera differed between sites, with the Juruá river basin showing the highest and lowest accumulation of genera, low (39) and high (20) respectively, but the lower portion of the Purus river also presented 20 genera. Concerning the composition of ant genera, there was no difference between most of the sites sampled, except for the high portion of the Purus river basin, which exposed a group slightly different from the others. This study shows that multiple sites within the same watershed may harbor different numbers of ant genera and different composition. Although this sampling will continue, in addition to species identification at the species level, these patterns may become clearer with these new samplings. (CNPq, UFAC)

3.3.64 THE ROLE OF MIRMECOCHORY DURING SECONDARY SUCCESSION IN A SEASONALLY DRY

3.3.65 TROPICAL FOREST

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Many areas of tropical forests are replaced by agricultural fields and pastures, but after some years they usually are abandoned and they may to give place to natural regeneration process. The expansion of secondary forests worldwide has increased the interest of scientific community in verify whether secondary succession recover biodiversity and ecosystem functions and services. In this study we investigated whether the seed dispersal service provided by ants is recovered along a successional gradient in Caatinga dry forest. The study was carried out at the Catimbau National Park, Buíque, PE, in 10 plots of 20 m × 50 m established in areas with different ages of abandonment after slash and burn agriculture (i.e. chronosequence) and five plots with the same size in areas that were not used as agriculture field in the last 150 years (control). We used biomass as a proxy of succession age. We also included precipitation in our models due to variation along plots. In each plot we offered diaspores of four myrmecochorous species (*Cnidosculus bahianus* (Ule) Pax & K. Hoffm, *Croton argyrophylloides* Muell. Arg, *Croton heliotropiifolius* Kunth e *Jatropha mutabilis* (Pohl) Baill.) and observed the species richness dispersers, number of seed-ant interactions, removal rate and dispersal distance as measures of seed dispersal quality. We did not observed changes in the seed dispersal service (removal rate, dispersal distance) with increasing biomass and precipitation. Richness of ants dispersers did not vary along of successional gradient. Removal rate varied along plots and was generally lower compared to other studies in Caatinga. However, dispersal distance was high and similar to previous studies, as *Dinoponera quadriceps*, the most important high-quality seed disperser in Caatinga, was present in all plots along the successional gradient. Our findings indicate that secondary succession did not recover seed dispersal service, especially in terms of number of interaction and removal rates. These results may have negative implications to regeneration of degraded areas in Caatinga, as basic services as seed dispersal are not recovered with succession. (UFPE, CNPq, CAPES, FACEPE)

3.3.66 THE ROCK AS A SEED AND THE ANT AS A HARVESTER IN THE CONSERVATION OF ATLANTIC FOREST REMNANTS ON INSELBERG SUMMIT

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The Brazilian Atlantic Forest is a global biodiversity hotspot, with a rich and unique flora, remaining in just 11.7% of its original covering. In southeastern Brazil, the Atlantic Forest domain harbours a huge concentration of monolithic inselbergs. These old granitic and/or gneissic outcrops are colonized by rupicolous plants, but occasionally forests can be found on their summits. Difficulties of access due to steep slopes made those rock associated forests relatively well conserved in comparison to the surroundings, but almost no studies are available about their biota. Ants play a key role in ecological communities on tropical ecosystems. They respond to vegetation structure and are responsible for important processes, such as plant species dispersal and seed collecting. In this context, the present study aims to (i) investigate the diversity of ants in an inselberg and (ii) see if this assembly is a subset of the Atlantic Forest myrmecofauna. Additionally, in order (iii) to explore the link between ants, plants and microhabitat resources, we analysed the floristic inventory from the outcrop. We focused on litter-dwelling ants, using pitfall traps in vegetation patches on a completely isolated inselberg (situated c. 900m asl) only reached by helicopter in Teófilo Otoni, Minas Gerais, Brazil. We identified nine ant species, belonging to five genera and three subfamilies. Both the myrmecofauna and the floristic composition presented typical elements of the Atlantic Forest. Seed removal ants (*Pheidole radoszkowskii* and *Pachycondyla striata*) were dominant. This was also observed for the “Capões de Mata” in *Campo Rupestre*, where islands of forests are surrounded by a rocky matrix. All the plants with fleshy fruits were in the forest, while plants in the vegetation patches had dry fruits and anemochoric seeds. So probably the summital forest might be the main source of supplies for the ants. The presence of seed collecting ants could indicate that these animals are important for spreading the seed shadow in the small and isolated forest remnant, allowing new seedlings to reach conditions to emerge and thus guaranteeing the permanence of the forest. Therefore, considering that less than 10% of the Atlantic Forest is protected by Conservation Units, inselberg forest remnants together with ant assembly might play a significant role as hope spots for the maintenance and restoration of this biome. (CNPq)

3.3.67 ANTS ROLE AS BIOINDICATORS OF FOREST DISTURBANCE

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Currently we are facing many ecosystem changes derived from years of anthropogenic disturbance on natural environments. Amongst human-derived impacts, deforestation stands out due to its enormous impacts on vegetation structure and irreversible changes on biological community's structure. This study aimed at analysing the effects of soil disturbance and forest homogenization on ground-dwelling ant richness, recruitment and dominance. We hypothesized that: (i) Ant richness will be negatively affected by disturbance and vegetation complexity (mahogany monoculture vs. native Atlantic Forest); (ii) Soil disturbance will affect the time of resource discovery by ants, as well as ant richness, recruitment and resource dominance. This study occurred in Rio Doce State Park, a protected area of Atlantic Forest in southeastern, Brazil. We experimentally simulated a soil disturbance by removing the leaf litter and superficial soil layer in a 3x3 m square, in two types of forest that differ in terms of vegetation structure: mahogany forest monoculture and preserved Atlantic Forest. We sampled ants using a paired mix bait of tuna (protein) and honey (carbohydrate) in 12 points, half of them in each forest type. Each pair of bait was exposed for 50 minutes, in which we registered ant richness, recruitment and dominance in every 10 minutes interval. As expected, we have higher values of ant richness in preserved and non-disturbed sites. Thus, ant richness decreased with disturbance in both forest types (mahogany and preserved forest), with intensified effects under forest homogenization. Resource discovery was faster under forest simplification (disturbed mahogany), but resource dominance turns to be higher in undisturbed native forest, after few minutes of resource availability (up to 10 min). Litter heterogeneity seems to play an important role in determining ant dispersion and intraspecific communication, as we observed that disturbance impacts were intensified by forest simplification. Our results highlight the efficiency of ants as bioindicators of disturbance. Due to the observed role of ants in habitat quality detection and the great amount of ecosystem functions they play, they should be considered as top priority for ecosystem preservation. (UFOP, CAPES, CNPq).

3.3.68 AZTECA CHARTIFEX (FORMICIDAE) INFLUENCE ON LEAF MICROBIOTA OF *BYRSONIMA SERICEA* (MALPIGHIACEAE)

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Interaction between ants and microorganisms on leaf surface of host plants is a neglected aspect of ecology. There is evidence that the high density of ants in a given leaf habitat can substantially affect the microbiota and its relationship with the plant. In a preliminary way, this work aimed to determine the extent to which the microbiota associated with dominant arboreal ants could act to inhibit invasive and potentially entomopathogenic microbial groups. For this, we have verified the influence of the interactions between the dominant ant, *Azteca chartifex*, the host plant *Byrsonima sericea*, and Gram-positive and Gram-negative bacteria associated with workers' bodies and leaf's surface. In addition, we have tested the direct inhibitory effect of mutualistic bacteria associated to ant's exoskeleton against bacteria linked to *B. sericea* leaf's surfaces. Finally, we evaluated if Gram-negative ants' bacteria, have greater inhibitory potential than Gram-positive bacteria, due to this group adaptive advantages for extreme environmental occupation. We have found that *A. chartifex*'s bacteria had a higher growth rate on Gram-positive bacteria of leaves that do not interact with these ants, suggesting the inhibition potential caused by ants' microbiota. Additionally, we have detected that the highest growth rate of ants' bacteria was from the original nest, compared to the satellite nests. Proteobacteria, Firmicutes and Actinobacteria were the three most representative phyla of ants' bacteria. The Gram-negative bacteria were the most representative in the three groups of samples. Therefore, our findings suggest that ants carry bacteria capable of inhibiting microorganisms exogenous to *A. chartifex*-associated microbiota. Moreover, Gram-negative bacteria should be more competitive than Gram-positive. Thus, there is a greater investment in defense inside colonies wherein there is greater density of individuals, selecting more aggressive isolates on exogenous bacteria inhibition. (UFOP, CNPq, CAPES).

3.3.69 EDGE DISTANCE EFFECTS IN THE DISTRIBUTION OF ANTS (HYMENOPTERA, FORMICIDAE) IN A FOREST FRAGMENT AT CENTRAL AMAZON

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Edge effect is considered a direct consequence of forest fragmentation and can cause abrupt changes in biotic and abiotic factors in forest fragments, mainly in urban forests, in which changes in the dynamics and composition of populations and communities are expected. The disturbances caused by fragmentation, mostly by edge effect, can be observed through the study of ants biodiversity, given that they are able to respond to the environmental stress. In this study we evaluated the fragmentation effects, specifically the edge effect, on the richness, abundance and composition of ant assemblages in an urban forest fragment of Central Amazonia. Samples were collected in the period of September 2012, at UFAM campus, along 10 riparian plots. The ants were collected using *pitfall* traps, with 10 traps per plot. We used a permutational multivariate analysis of variance (PERMANOVA), based on Sorensen's distance measure of the presence-absence data, in order to relate the ants composition with the edge distance and the road construction as well. An ordination plot of the ant species was created to represent their distribution. All analyzes were performed using the R (R Core Team, 2019) software. Altogether, 1.639 ants were identified in five subfamilies, 24 genera and 57 species / morphospecies. The subfamilies recorded were Myrmicinae, Formicinae, Ectatomminae, Ponerinae and Dorylinae. *Pheidole*, *Camponotus* and *Crematogaster* were the genera that showed the greatest richness. According to our analyzes, the species occurrence is distributed evenly along the fragment plots, not being directly influenced by the effects of the variable tested in this study. It is possible that the presence of ants species even in the plots near the edge of the forest, where there is greater light entry and lower humidity, that is, less favorable areas for nest establishment of the ants, are being influenced by the presence of the valley. The moisture maintained by the valley in these riparian plots, can act counterbalancing the strict effects caused by the fragmentation, thus not affecting the species diversity of ant communities.

3.3.70 IT IS NOT RAINING IN THE TROPICAL FOREST: ANT RESPONSES TO AN EXPERIMENT IN THE AMAZON

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Recent climate simulations in the Amazon region incorporate deforestation and especially precipitation reductions that would affect community responses and environmental stability of tropical forests. Here we evaluated ant species composition in a plot of Amazon forest submitted to a long-term through-fall exclusion experiment. The ant survey was carried out at a control and an experimental plot of the Projeto Seca Floresta (ESECAFLOR), Caxiuanã National Forest, Pará, Brazil, where in 2002 an area of one ha of forest was modified to simulate prolonged periods of drought. Ground-dwellings ants were sampled monthly using pitfall traps in 50 subplots at each site, totaling 1000 samples. We tested the hypothesis that fewer ant species will be associated to each plot individually or that greater part of species will be common to both plots. To test our hypothesis, we used the Multinomial Species Classification Method (CLAM). The test rank species into four groups based on their frequency of occurrence and a defined specialization value of 66%. The tested groups were: (i) preferably at the control site; (ii) preferably at the site under water exclusion; (iii) without preference among categories (i.e., generalists); and (iv) species with low occurrences. Overall, we collected 241 species belonging to 57 genera and 10 subfamilies. We recorded 191 species at the control plot and 172 species at the experimental plot; 123 species were shared between plots. Our hypothesis was corroborated since 46 ant species (21%) had no site preference as determined by CLAM. We found eight ant species associated with the control site (4%; *Neoponera verenae*; *Ochetomyrmex neopolitus*; *O. semipolitus*; *Odontomachus* cf. *bauri*; *O. dontomachus* pr. *hematodus*; *Pheidole* (gr. *Fallax*) MPEG 03; *P. jeannei* and *Strumigenys denticulata*) and 11 ant species were associated with water exclusion (5%; *Apterostigma* pr. *pilosum*; *Azteca* MPEG 01; *Crematogaster* MPEG 01; *Mayaponera constricta*; *Neivamyrmex* MPEG 02; *N. pseudops*; *Nylanderia* MPEG 01; *Pheidole* (gr. *Diligens*) MPEG 05; *P. bruesi*; *Rasopone* pr. *pergandei* and *Trachymyrmex* cf. *bugnioni*). The largest component of the local ant fauna (153 species; 70%) presented low occurrences, which did not allow determine site associations for these species. Although most of ant species did not respond to drought stress, some ants provided evidence of drought impacts on tropical ground invertebrates. (ECFPn; CNPq-PCI-DC-313516/2015-4, PCI-170220/2016-8, PCI-170088/2017-0 and CAPES)

3.3.71 DOES TEMPORAL PARTIONING MEDIATED BY TEMPERATURE EXISTS ON ANT COMMUNITIES IN RESTINGAS FRONTAL DUNES?

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Temperature is an important environmental condition shaping species distribution, and its importance on the structure of ant communities has been described in the most recent ecological studies. Ants are ideal models to test the effect of temperature on community structuring by the fact of being little ectotherms and widely distributed, so as on frontal dunes of Restinga ecosystems. The temperature varies considerably along the day to the night in Restinga and should be an important structuring force shaping the community structure and species composition. Taking this into account, we aimed to answer the question: Does the ant community on Restinga frontal dunes structured by temperature? For this we evaluated the following hypothesis: (i) the ant species composition varies along different periods of the day, and consequently different temperatures; and if (ii) in the warmest periods there is a decrease in richness with an increase in abundance of specific ant species. We plotted arbitrarily a transect (450m) parallel to the tide line of the sea comprising 15 pitfalls traps 30 meters apart from each other. The pitfalls were exchanged in five sampling periods as: T1 (9:10am-1:10pm), T2 (1:40pm-6:40pm), T3 (7:00pm-11:00pm), T4 (11:00pm-03:00am) and T5 (03:00am-7:00am). In each period we recorded the temperature and the moisture. We found 11 ant species. Our results show that ant richness and abundance on diurnal periods was higher than in the night periods, thus suggesting that temperature affected these two community traits positively. Species composition also changed over the periods, although, not was explained by temperature. Moisture seems to explain changes in the species composition through the different periods. The morpho-species *Dorymyrmex* sp. 02 was indicative of the period T1 (9:10am-1:10pm) suggesting a preference for high temperatures and low moisture. *Mycetophylax morschi* also was restricted to the warmest periods, and this is the first record of occurrence to Espírito Santo State. These results indicate that exists a merged pattern between temperature and moisture, which, both these factors are correlated and play an important role in structuring ant communities with some species preferring warmest periods with low moisture on Restinga frontal dunes. (UFES-CEUNES; UFOP, CNPq; PEI; IEMA-ES)

3.3.72 HIGH BIODIVERSITY SILVOPASTORAL SYSTEM CONTRIBUTE TO ANT DIVERSITY CONSERVATION IN AGROECOLOGICAL LANDSCAPE MATRIX

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In agricultural landscapes, improving quality of the matrix found between native vegetation fragments may increase biodiversity and enhance the ecosystem services provided. Pastures managed for milk production containing nuclei of planted native trees constitute agroecological silvopastoral systems that may contribute to biodiversity conservation, including the myrmecofauna. In this work we assessed richness and composition of epigeic ant species in three components of the agricultural landscape (small Atlantic Forest fragments, nuclei of native tree species in pastures and pastures without nuclei) in three rural properties located in the municipality of Santa Rosa de Lima, Santa Catarina, South Brazil. We installed ten pitfall traps along a 100 meter transect in each habitat of each property, with traps separated by ten meters, comprising 90 sample points in total. Traps remained on the field for 48 hours. We obtained 55 ant species belonging to 22 genera and 6 subfamilies. Species accumulation curves suggested that total richness in nuclei (31 spp.) and fragments (29 spp.) was similar, but higher than in pastures (17 spp.). However, the average number of species per trap did not differ between habitats. This suggests lower species turnover and variability in pastures, compared to the other habitats. On the other hand, species composition was more similar between nuclei and pastures, and distinct from forest fragments. Thus, ant communities inside nuclei still resemble more the ones from pastures, regardless of the occurrence of some species characteristic from forests (e.g. *Gnamptogenys striatula*, *Odontomachus chelifer*). Our results show that, after six years, small arboreal nuclei immersed in pastures harbor a combination of pasture and forest ant species, with increased richness, even if pasture species still prevail. Such nuclei increase biodiversity and may act as steppingstones for the dispersal of forest species among fragments. This agroecological system will be continuously monitored, to observe how further growth of the nuclei will influence the ant communities within them. (UFSC, CAPES)

3.3.73 SITE CHARACTERISTICS SHAPE THE TAXONOMIC AND MORPHOLOGICAL DIVERSITY OF ANTS IN OPEN VEGETATION HABITATS IN EASTERN AMAZONIA

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The Amazon is a heterogeneous biome, mostly composed of rain forests; however, various types of natural grasslands co-occur within these forested habitats. Amazonian grasslands are of particular importance for biodiversity conservation because they support numerous endemic species of plants and animals. But they are also highly threatened and poorly understood. In this study, we evaluated how local characteristics affect the taxonomic and morphological diversity of the ground-dwelling ant fauna inhabiting grasslands in Eastern Amazonia. We recorded 89 ant species collected in 420 pitfall traps (21 transects × 20 traps) in two types of open vegetation habitats: *campinarana* (unique to Amazonia; five sites) and savanna (two sites). We examined sixteen traits representing various aspects of ant ecology to describe the morphological structure of ant assemblages. We measured variables to characterize site characteristics in terms of their habitat complexity and natural seasonal influences (vegetation structure (height), soil cover, soil type, and presence/absence of signs of flooding). We compared the effects of site characteristics on (i) taxonomic richness, (ii) morphological richness, and (iii) standardized morphological richness (SES values) of the ant assemblages using linear mixed models (LMEs). We found significant differences among sites in terms of their species richness, which was positively associated with vegetation complexity. Taxonomic diversity showed no relationship with site characteristics. The best model for morphological diversity had species richness, presence of flooding, and soil type as predictors of morphological diversity. Species richness had the strongest positive relationship with morphological diversity, explaining most of variance captured by the models, followed by flooding, and soil type. Our study found that morphological diversity of ground-dwelling ants in Amazonian grasslands had a significant, positive association with flooding and a significant, negative association with clayed soils. Our results can be used as guidelines for future studies about ant morphological diversity in the Amazon and their relation to Amazonian ecosystems, especially for non-forest ecosystems, which have historically been neglected and poorly preserved. (CELPA/Fapesp proj. 3362)

3.3.74 RECORD OF NEW SPECIES OF FORMICIDAE FOR THE STATES OF PARANÁ AND SANTA CATARINA, BRAZIL

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From the collections made in surveys of the ant fauna between 2016 and 2019, in the states of Santa Catarina and Paraná, Brazil, there was the occurrence of five species that, according to the current literature, do not yet have a record of distribution for these regions. The goal of this study was to record the distribution of these species in these states and with that, contribute to the knowledge of the myrmecofauna of the region. Collections were made in silviculture of yerba mate, crops of *Zea mays* L. and on *Campomanesia xanthocarpa* (Mart.) O. Berg. Manual collection techniques, tree and soil pitfalls were used. In the period from December 2016 to March 2017, three specimens of *Gracilidris pombero* (Wild & Cuzzo, 2006) (Dolichoderinae) were collected for the State of Santa Catarina (26° 18' 21" S; 51° 02' 48.81" W), through the use of soil pitfalls in a crop of *Zea mays*. The same species was collected on May 10, 2018, in the State of Paraná (26° 26' 19.8" S, 50° 57' 46.9" W) on *C. xanthocarpa*, using tree pitfalls. In the State of Paraná, from August 2018 to March 2019, in areas of silviculture of yerba mate (*Ilex paraguariensis*) there were: *Crematogaster stollii* (Forel, 1985) with 15 individuals collected manually (S 25° 44' 27.7" W O 50° 26' 17.1"); *Nylanderia docilis* (Forel, 1908) (Formicinae) with 18 individuals collected (25° 44' 49" S 50° 25' 42" W; 25° 44' 27" S 50° 26' 17" W; 25° 46' 40.5" S 50° 23' 10" W; 25° 44' 45" S 50° 26' 06" W; 25° 46' 41" S 50° 24' 0" W and 25° 43' 0.8" S 50° 25' 53.5" W); *Nesomyrmex costatus* (Emery, 1896) (Myrmicinae), with three individuals collected manually and two by tree pitfalls (25° 44' 49" S 50° 25' 42" W; 25° 44' 27" S 50° 25' 17" W and 25° 46' 41" S 50° 24' 0" W) and *Neoponera latinoda* (Mackay, W.P. & Mackay, E.E., 2010) (Ponerinae) with three individuals collected manually and two by tree pitfalls (25° 44' 49" S 50° 25' 42" W; 26° 11' 47" S 51° 00' 54" and 25° 44' 27" S 50° 26' 17" W). (Fundação Araucária).

3.3.75 PRELIMINARY LIST OF ANTS ASSOCIATED TO ERVA-MATE (*ILEX PARAGUARIENSIS* ST. HILL)

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Yerba mate or *Ilex paraguariensis* St. Hill is a native tree species with an important economic role in the southern states of Brazil, especially in Paraná. There is a shortage of studies with ants in this agroecosystem. In this context, this study aimed to analyze the richness of ants associated with this form of silviculture. Data were collected in 15 silvicultures of yerba mate located in southeast of Paraná, between latitudes 25° and 26° and longitudes 50° and 51°. The silvicultures were categorized as to the type into: native; native dense, shaded, and full sun. Ants were sampled in each silviculture of yerba mate by direct capture with ten replicates of 15 minutes each and equidistant 200 m, from August 2018 to February 2019. Raw data were organized in record and frequency of occurrence and the assemblage was estimated by Chao2. There were 99 species grouped into 33 genera and 8 subfamilies. Myrmicinae presented higher richness, followed by Formicinae and Ponerinae. The genera with the highest richness were Pheidole (S = 12) and Camponotus (S = 10). The shaded plantations presented the highest richness and abundance of occurrences (S = 83, A = 436), followed by native dense (S = 62, A = 242), native (S = 47, A = 143) and full sun (S = 32, A = 87). In the different types of plantations, a similar fauna of 11 species was registered. The rarefaction curve did not reach an asymptote, and it is estimated that the richness is approximately 14% higher than that already recorded. Silvicultures of yerba mate are important systems that maintains the diversity of ants. There is a need for more collections. The results can support future works that aim at sustainability in these agroecosystems. (Fundação Araucária)

3.3.76 ACROCOMIA INTUMESCENS DRUDE AS ISLANDS TO LEAF LITTER ANT SPECIES

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Island Biogeography Theory (IBT) predictions have been tested repeatedly in true islands and in environments facing some level of insularity as tree canopies, lakes and forest fragments. Regarding plant biodiversity, IBT predictions have also been successfully applied to understory gaps originated by palms in tropical wet forests. Palms produce a dense leaf litter which jeopardizes plant recruitment opening huge gaps in forest understory which could secondarily affect even animal species, like ants. Ants perform important ecosystem functions and their abundance and diversity change quickly along environmental gradients. Consequently, ants are an appropriate group to test IBT predictions in insular habitats like palm tree gaps (henceforth gaps). The aim of this work is to test if palm tree (*Acrocomia intumescens* Drude 1892) works as islands to ants. We predict that: 1) ant species richness is greater in forest understory if compared to gaps; 2) ant species composition differs between forest understory (control) and gaps; and 3) bigger and less isolated gaps present higher ant species richness. We picked 10 palm individuals (minimum distance among individuals 100m) and measured the two greater perpendicular diameters of the gap around the individuals to calculate the gap area based on ellipse. We counted the number of other palm conspecific individuals as a proxy to isolation within a radius distance of 10 meters for each focal individual. For each gap, we sampled ant fauna using two pitfall traps active for 48 h. We used as a control, a plot sampled with two pitfall traps 20m away from the palm tree gap. For each gap and control plot, we calculated species richness considering the two pots. We sampled 233 individuals, from 15 genera and 28 morphospecies. Ant species richness between gap and control plots were similar (4.2 ± 2.2 and 3.8 ± 2.1 , respectively – mean \pm DP), but ant species composition differed between the two habitats. Area and isolation did not affect ant species richness. Diverging environmental characteristics between gap and control areas may promote ant species replacement making species richness constant, but changing species composition across plots. Even though gaps can act as islands harbouring different ant species compared to ordinary understory, our results did not concur with IBT predictions. Therefore, we suggest that the processes that explain the similarity in species richness and community dissimilarity among the gaps may be more related to resource availability (niche related) than dispersal. (UFPB, CAPES).

3.3.77 ANT DIVERSITY MEDIATED BY MOUND FIELDS OF CAATINGA

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Logging is one of the main threats to tropical biodiversity. In tropical dry forest this is even more worrying because of the risk of desertification. So, understanding how biodiversity responds to this disturbance is key to conservation actions. In this context, we compared the epigeic myrmecofauna diversity between Caatinga areas with earth mounds (mound fields: fields with numerous regularly spaced mounds) and areas without mounds. The mound fields are a natural Caatinga event and occupy large areas. It has white soil (quartz-rich podzols) or red soil (latossols). The mound fields on white soil exhibit a diverse thorny plant community and the mound fields on red soil have vegetation shrubby and homogeneous. We selected two mound fields on white soil, three on red soil and three Caatinga areas without mounds in the Contendas Sincorá National Forest, Bahia, Brazil. At each localization, sampling was taken using pitfall traps. In total we collect 100 samples in mound fields and 60 samples in areas without mounds. In general, the areas without mounds presented greater richness and diversity than the mound fields. The species richness of the areas without mounds (43 species) was practically double the species found in the fields (22 species). The mound fields on white soil presented greater diversity than the mound fields on red soil. This study shows that the mound fields of Caatinga are spots of lower ant richness and diversity - a finding contrary to the usual biodiversity hotspots on elevated mounds and tussocks in dry ecosystems. In many ecosystems, natural earth mounds increase the biodiversity because they provide greater habitat heterogeneity. However, in the Caatinga ecosystem, natural earth mounds did not add to the ant richness and diversity as compared to the surrounding sites without mounds. Probably the contrasting findings in our study reflect the degree of degradation of the areas which has witnessed human influence over recent decades, by removal of vegetation from mounds. Ants are extremely associated with vegetation and in fact, we show that their diversity is greater in mound fields on white soils which still have greater structural complexity, than mound fields on red soil. The high population of Caatinga advances the woody vegetation removal and it modified the structure and functioning of mound fields. This chronic anthropogenic disturbance is driving the vegetation of Caatinga towards species impoverishment and such modifications have important ecological implications for Caatinga Domain conservation. (UESB, PRONEX-PNX 0011/2009, CAPES)

3.3.78 DOES CAATINGA'S MOUND FIELDS INFLUENCE ON DISTRIBUTION OF *DINOPONERA QUADRICEPS* (FORMICIDAE: PONERINAE) POPULATION?

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The *Dinoponera quadriceps* ant, endemic to the Brazilian semiarid, builds nests under the soil and coexists conspicuously with the Caatinga's mounds. These mounds extend through the landscape forming fields of four thousand years as results of subterranean excavations carried out by the term *Sinternesdirus* when looking for food. In this context, our objective was to evaluate if the presence of the mounds exerts some influence on the populations of *D. quadriceps*. For this, we test the following hypotheses: (i) Abundance of nests and frequency of occurrence of *D. quadriceps* individuals is greater in mound fields than in Caatinga's areas without mounds (ii) There is a higher frequency of nests near the mounds than away from them. We selected two mound fields and two areas without mounds, where we installed eight plots of 400 m² (n = 32) where we recorded all *D. quadriceps* nests, installed pitfall to collect the ants and measured some biotic and abiotic parameters. As expected, nest density and frequency of occurrence of individuals were greater in the mound fields than in areas without mounds. We did not find attraction between mounds and nests. On an individual scale, mounds do not influence the establishment of *D. quadriceps* nests, however, on a landscape scale, there is a strong preference for these ants as they settle in the mound fields. Such preference may be related to the presence of subterranean termite tunnels that facilitate the digging of the workers in the construction of nests and / or the presence of termites that can be used as food resources by the ants. The mound fields are important sites for the Caatinga's biodiversity conservation (UESB, CAPES).

3.3.79 TELL ME WHAT DO YOU DO, SO I TELL YOU WHAT CAN AFFECT YOU: THE EFFECTS OF ANTHROPIZATION ON DIASPORE-REMOVING ANTS, AND CARCASS CONSUMERS

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Ants are important for ecosystem functioning, undertaking such functions as biological control, soil oxygen enrichment, nutrient cycling, and seed dispersal. However, anthropic actions modify the environment and may cause biodiversity loss and damage to ecosystem processes. This study aimed to test the hypothesis that the richness of diaspore-removing ants and carcass consumers are influenced by disturbance in a similar way. This study was carried out in the Pandeiros Environmental Protection Area in 17 areas of Cerrado *sensu stricto*, where we used artificial seeds to represent diaspores and rotting chicken feet to represent carcasses. The ants that interacted with the resources were collected and identified. We estimate anthropic disturbances through evidence of the following variables: fire, garbage, trail, cattle footprints and feces, soil compaction, exposed soil, percentage of natural area, civil construction, and distance from the nearest road and town. Ants removing diaspores and carcass users did not respond in a similar way to the variables tested. The amount of civil constructions was the only variable that positively influenced the richness of diaspore-removing ants, however it did not influence the richness of ants that interacted with the carcass. The process of house construction alters the natural environment and can increase the richness of ant species that are attracted to the resources coming from the facilities of these residences. This can influence ecosystem functioning, since the quantity and efficiency of seed removal and dispersal varies greatly between ant species. We believe that anthropic disturbances did not affect the carcass removers in the same way because carcass removers ants are specialists, for example the poneromorphs or resource dominators, and the genus *Solenopsis* all observed in our study, unlike the observed diaspore-removing ants that are also generalists. Thus, we observed that seed-removing ants and carcass consumers respond differently to anthropic environmental impacts, and these activities may affect the functioning of ecosystems. (CAPES, FAPEMIG e CNPq)

3.3.80 ANTS AS BIOINDICATORS OF CAATINGA'S MOUNDS FIELDS

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Mound fields constitute a natural Caatinga event and are constantly being disturbed by anthropic actions with decrease of vegetation cover by the removal of wood and conversion to pasture. Because to the abundance and dominance of the ants and because they are extremely associated to the vegetation, we evaluated mimercofauna in mounds with and without the presence of vegetation. Our hypothesis is that mounds with vegetation, present a greater diversity of species of ants. The study was carried out in two mound fields in the city of Iramaia / BA, Brazil. For the collection of the ants, we used pitfall traps that remained for 24h in the fields. We identified 19 ant species belonging to seven subfamilies and 11 genera. The most frequent species were: *Ectatomma muticum*, *Pheidole radoszkowskii*, *Pagonomyrmex naegelii*. There were no differences in the diversity between mounds with vegetation and without vegetation. As for ant species diversity, there was no significant difference between mounds with vegetation and ($1,91 \pm 0,32$) mounds without vegetation ($1,89 \pm 0,37$). The adjacent soil (intermound) presented greater diversity than the mounds. Although ant diversity has not been greater on mounds with vegetation, as expected, the greater diversity observed in the intermound soil demonstrates that mounds fields are favorable for foraging and / or nesting of ants. The vegetation in the mound fields, although scarce, can favor the appearance of species locally. In fact, in the intermound region, the soil exhibits a lower compaction and a pH less acid than the mound soils. These characteristics, associated to the origin of the mound fields, which advocates the existence of networks of tunnels in these places, favor the emergence of vegetation, even grasses. Mounds, on the other hand, are extremely compact soil sites, in addition to being leached, when devoid of vegetation, their potential to decrease locally the diversity of ant species has already been documented. The lack of differences in ant diversity in mounds with and without vegetation may be related to the positioning within the field, which in addition to presenting as regular structures and without overlap, are close. The shading effects of a tree established on a mound may favor the adjacent soil and go beyond the boundaries of its structure, perhaps reaching to nearby hills but without vegetation. This study points to the importance of the mounds fields for the conservation of the Caatinga biodiversity. (UESB, CAPES)

3.3.81 VULNERABILITY OF ANTS FROM THE BRAZILIAN CERRADO TO GLOBAL WARMING: THE INFLUENCE OF TIME OF ACTIVITY, FOOD PREFERENCE AND NESTING HABITS

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Global warming is one of the greatest threats to biodiversity conservation. Although the rate of warming is higher at higher latitudes, tropical ectotherms organisms are one of the most vulnerable groups to climate change. Ants are a dominant group of insects in tropical forests and savannas, and the objective of our study is to evaluate the extent to which the vulnerability to global warming varies among species from different habitats and/or that display distinct food preferences or time of activity. The study is being conducted in the Brazilian Cerrado. Until now, we have sampled two forest areas and two savanna areas. In each habitat we collected ants foraging on the soil surface and in the arboreal vegetation using sugar and crushed insect baits, during day (12:00am-01:30pm) and night (08:00pm- 09:30pm). We recorded the air temperature during all sampling events. The CT_{max} (maximum temperature tolerated by ant workers before dying) of the most common ant species was determined in the laboratory using a dry heat bath. We determined the CT_{max} of 26 savanna ant species (half of which were arboreal) and 12 forest ant species (all ground-dwellers). We found that arboreal savanna species presented the highest CT_{max} among the three groups, while the ground-dwelling ants from forest presented the lowest. The mean CT_{max} of arboreal savanna ants was 44.3°C (range: 42 to 47.3 °C), that of ground-dwelling savanna ants was 42.1°C (range: 40 to 44 °C), whereas the mean CT_{max} of ground-dwelling forest ants was 39.9°C (range: 36.4 to 42°C). Time of activity seems to have an influence on CT_{max}, but this was true only among arboreal savanna ants, for which CT_{max} was higher for diurnal than for nocturnal species. Trophic position had little influence on CT_{max}, except among ground-dwelling forest ants where herbivorous *Camponotus* ants showed lower CT_{max} than predatory poneromorph ants. The natural history of most tropical organisms is still virtually unknown, but understanding it might be the only way to conserve its biodiversity in the face of climate change. (PPG Ecologia UFU, CAPES, CNPq)

3.3.82 ANTS AS BIOINDICATORS IN THE RECOVERY AND CONSERVATION OF THE RIPARIAN ZONE OF UBERABINHA RIVER, UBERLÂNDIA – MG

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Urbanization is one of the greatest threats to biodiversity. Currently 55% of the world's population lives in urban areas, but in Brazil we already reached 86% of the population living in urban areas. Some of the impacts of urbanization may be loss of habitats and ecosystem services, fragmentation and biota homogenization. These effects act as new filters and selective pressures to species, giving rise to new distribution patterns and communities compositions. However, in cities we can find green areas (urban parks, riparian zones and gardens) that can function as reservoirs of native species. Among insects, ants are a group widely used as bioindicators because of their wide geographical range and role in ecosystem services, for example pest control, herbivory defense, nutrient cycling and seed dispersion. The aim of this study was to verify whether a reforested riparian zone sustain greater species richness of ants than an adjacent non-reforested area in an urban zone. Collections were carried out in a riparian zone within the urban area of the city of Uberlândia - Minas Gerais. An area of the riparian zone has been reforested 10 years ago and an adjacent area is maintained with only grass for leisure purpose. For six months, from January to June of 2018, day and night collections of ants were carried out using sardine and honey baits in the soil of these two areas. Temperature and humidity were also recorded at both sites during collection. A total of 34 ant species were found, 17 occurred on the grass and 33 in the reforested area. Species richness was higher during day than night, five strictly diurnal and two strictly nocturnal species were found in the grass, while eight strictly diurnal and four strictly nocturnal species in the reforested area. Ant species richness was higher in the reforested area over the six months, with decrease in the dry periods of the year. Differences in richness between sites are probably linked to environmental factors, since the grass is a homogeneous and exposed environment with few resources while in the reforested area there is presence of trees in abundance, greater shading and accumulation of resources. Riparian zones are hot spots for maintaining biodiversity and are often the only green areas in cities. With the expansion of urbanization, reforestation of riparian zones can become an important tool for the conservation of invertebrate biodiversity even in urban areas. (CAPES)

3.3.83 THE DIVERSITY OF EPIGEIC ANTS (HYMENOPTERA: FORMICIDAE) IN AGRICULTURAL SYSTEMS: COMPARING ORGANIC AND CONVENTIONAL ONES IN A SUBTROPICAL REGION

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Agriculture has been the main responsible for the negative impacts on the environment, causing the loss of biodiversity due to the fragmentation and destruction of the native vegetation, which leads to habitat loss. The region of the cities Canguçu and Morro Redondo (interior of Rio Grande do Sul) is known by its high amount of properties that make use of sustainable agricultural practices. However, few studies have shown how the different agricultural practices possibly affect the diversity of ants, especially in the Pampa biome. This study aims to contribute to the understanding of the pattern of diversity of ants inside that biome by analyzing how the epigeic ants assemblage vary between environments of agricultural conventional exploit and organic exploit. The objective is to evaluate richness, abundance and composition of ants associated to the two systems inside the cities of Canguçu and Morro Redondo. Thus, we selected six rural properties - of those, three are organic and three are conventional, according to the agricultural practices applied in them - where we sampled the ants fauna between January and March of 2019. In each property, we put 30 *pitfalltraps* for 24 hours in six sample transects- three in cultivation areas and three in forests of conservation reserve. We registered the quantity of individuals and morphotypes of ants in each trap, collecting 4572 individuals. The average abundance of individuals per trap did not vary significantly between the organic cultivation, the conventional cultivation and the organic forest. Nevertheless, we found a smaller amount in the conventional forest than in the other environments. Preliminary results showed that the richness of morphotypes in organic properties was higher in the cultivation area than in the forest. In the conventional properties, the forests are richer in morphotypes. Although the composition analyses are in progress, it is possible to observe that the organic cultivation varied less in the diversity of ants when compared to the forest of organic cultivation. The greater abundance observed in conventional cultivation when compared to its forest may be associated with the negative effect of its farming system, which favors some species and reduces the richness of species. Therefore, it highlights the importance of the presence of the forests for the preservation of biodiversity. We conclude that organic cultivation does not demonstrate negative effects of these agricultural practices on ant richness (FAPERGS).

3.3.84 BEYOND GOOD AND EVIL: CHRONIC ANTHROPOGENIC DISTURBANCES AND RAINFALL MODULATE the role of LEAF-CUTTER ANTS AS ECOSYSTEM ENGINEERS

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Leaf-cutter ants (LCA) are known as voracious herbivores and ecosystem engineers and the outcome of their interaction with plants can be mediated by negative effects of plant biomass removal, and/or by positive effects of soil fertilization through the nest refuse dumps. Soil fertilization may increase plant survival and growth, but its influence on regenerating plant assemblage is poorly known. Additionally, soil fertilization mediated by LCA can also be dependent on other environmental features, like rainfall and anthropogenic disturbances. In Caatinga ecosystems, rainfall is an important natural gradient affecting vegetation and, nowadays, chronic anthropogenic disturbances (CAD) have been described as an important non-natural gradient affecting Caatinga biodiversity. Understanding the role of LCA as ecosystem engineers is strategic because Caatinga is predicted to become hotter and drier as climate change rises and it is also expected that Caatinga ecosystems become more CAD-affected in the near future. We asked if LCA nest presence interacts with rainfall and CAD influencing seedling survival in Caatinga. We examined the effects of LCA nests (mound and refuse dumps) on the survival of *Cenostygmia pyramidale* (catingueira - vernacular name) seedlings, a small, mid-successional tree species endemic to Caatinga. We conducted bioassays placing sets of ten catingueira seedlings on LCA nest mound, refuse dump and in ant-free areas (30 m away from any LCA nest) as control. All plant individuals were protected against LCA herbivory. We monitored seedlings monthly from June-October 2015 (late rainy to early dry season). As dry season escalated, all seedlings died, but survival trajectory differed considering the other variables. Seedling survival on control plots and refuse dumps were about 1.4 times higher than on nest mounds probably because nest mounds exhibit more compact and mineralized soil, and tend to present lower levels of organic matter. Both rainfall and CAD increased seedling survival despite LCA nest presence. The first because wetter sites are more friendly environments concerning plant survival, and the second probably due to the catingueira generalist character. As gradients interacts, we also found that the most favorable environment to plant survival is wetter and less CAD affected. This interactive effect, however, is context dependent. For example, in wetter sites, increasing CAD reduced survival, but this tendency was reversed in the drier sites. Finally, we provide evidence that the LCA role as ecosystem engineer does not change along CAD and rainfall gradients, which may actually drive seedling survival and recruitment in Caatinga ecosystems. (CNPq, FACEPE)

3.3.85 GAMMA AND BETA DIVERSITY OF ANT ASSEMBLAGES AT LANDSCAPE SCALE ALONG A GRADIENT OF FOREST COVER

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Landscapes under high anthropic influence, besides presenting low species diversity, present high occurrence of tolerant species to disturbances, which due to the low abiotic and biotic restriction, are widely distributed leading to simplification on species composition. We used ant assemblages to test the hypothesis that forest cover promotes spatial heterogeneity which in its turns positively affects the number of ant species and limited species distribution at landscape scale. We sample ants along 12 circular landscapes (radius: 500 m) distant 5 km from each other and with different forest cover percentage (13 – 100%). The landscapes were oriented along a road inside Extractivist Reserve Chico Mendes in Assis Brasil – AC, Brazil. In each landscape, we distributed 16 pitfall traps along the four radial transects (four traps 100 m apart per transect). To each landscape, we quantified the percentage of forest cover from satellites images. The spatial heterogeneity of landscapes was obtained from horizontal vegetation structure and soil cover data sampled surrounding (circular areas with 5 m of radius) each pitfall trap. The landscapes were ordered according to the variance of these parameters, which landscapes with highest values of variance were considered more heterogeneous. The gamma diversity was additionally partitioned in its alfa and beta components. However, as we are interested on number of species and species composition at landscape scale, we considered only the response of gamma and beta diversity to forest cover and spatial heterogeneity because they are directly related to these two parameters. Both, gamma and beta positively respond to forest cover increasing. Landscapes with highest forest cover presented highest spatial heterogeneity. Furthermore, spatial heterogeneity led to high gamma and beta diversity. Thus, landscapes at low levels of forest cover probably offer a limited habitat, resource and conditions variation harboring a low number of ant species (low gamma diversity) and these species can easily disperse within the landscape which simplify species composition (low values of beta diversity). In the landscape at lowest forest cover, nine of the 27 species are present in all transects, which expressive contributed to a low beta diversity (13,25). However, in the landscape with 100% of forest cover, only two of the 67 species were presented in all transects, resulting in a high beta diversity (45,25). Therefore, forest cover is a key driver of spatial heterogeneity, which in its turns positively affect gamma and beta diversity, useful proxies to biodiversity monitoring in human-modified landscapes. (CAPES, PEER/NSF – USAID, FAPAC)

3.3.86 RESPONSE OF ANT SPECIES RICHNESS TO ABIOTIC FACTORS IN THE CAATINGA OF NORTHEAST BRAZIL

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Seasonal dry forests, like the caatinga, are among the most threatened terrestrial ecosystems due to the intensification of human activities. These activities are considered to be the main cause of increase in areas going through the process of desertification. The Caatinga is considered to be an ecosystem with severe abiotic conditions, presenting high rates of: temperature, solar radiation, evapotranspiration; low: cloudiness, low relative humidity and low precipitation, aspects that have a profound influence on its biota. The richness and composition of ants species can vary according to altitude, latitude and climatic conditions such as temperature and humidity. Thus, the abiotic factors of the biome can influence the richness of ants species. We performed samplings at the State Park Pedra da Boca, Paraíba, where a 200 m transect was installed containing 20 pitfall traps made with plastic cups of 200 ml that remained in place for 48h and were spaced 10 m between each other. In addition, at each sampling point there were measurement of the incidence of light, humidity and local temperature using a digital thermo-hygrometer. For the data analysis we used the Pearson correlation coefficient to correlate the ants species richness with the parameters collected in the field. Twenty-two species of ants were found. We verified that the ant species richness did not correlate with any of the evaluated parameters, showing that the ant richness of the area is not influenced by abiotic factors. The non-correlation between ant species and the measured parameters should be attributed to the high dispersion capacity of ant species in the Caatinga biome, which surpass the environmental filter promoted by measured abiotic factors. In conclusion, the factors related with the Caatinga ant assemblage should be associated with parameters of greater variation within this biome, such as vegetation structure and composition, degree of conservation of the area or microclimatic variations of the environment.

3.3.87 IS THERE A DIFFERENCE BETWEEN PERIODS FOR SAMPLING ANT SEED REMOVERS?

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Ecological functions played by ants, such as those associated with the removal of resources from tropical forests are essential to ecosystem functioning. These functions can be compromised by frequent changes in land use, making forest environments completely open and with limited resources. Monitoring activities linked to natural regeneration, such as ant-mediated seed removal, is critical to tracking the return of these functions to areas that have been subject to major disturbances. However, monitoring or estimating functions is something that demands time and therefore faster and low-cost sampling / observation protocols are required, but which offer clear and reliable standards on the functions performed by ants. Here, we evaluate whether the response of seed remover ant assemblages and their seed removal activity is influenced by the sampling period chosen. Specifically, we address the following question: Is there a difference between periods (morning and afternoon) for ant sampling and its seed removal activity in the monitoring of impacted areas? For this, we analyzed the richness, the composition of species and the percentage of seed removal in 10 forest fragments, representing complex environments with a greater variety of resources, and 10 pastures, representing open environments with limited resources, in different periods - morning and afternoon. We found that, regardless of the sampled environment (i.e., forest fragments or pastures), both the richness and the composition of ant-removal species and the removal of seeds do not differ between periods (morning and afternoon). We indicate that the studies whose objective is to evaluate the diversity and activity of seed-removing ants can be carried out in a single period without significant loss of information. We emphasize the importance of studies that, like ours, contribute to the reduction of sampling methods costs and field practices that guide research and that are fundamental to promote a more efficient use of ants and their functions in monitoring impacts or recovery of degraded areas. (UFAC, CAPES, CNPq)

3.3.88 ANTS LIVING IN ESPIRITO SANTO'S COASTAL ENVIRONMENTS: A SYNTHESIS

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Restinga is a coastal environment strongly influenced by salt spray and sandy soil, presenting high heterogeneity. There are different phytophysionomies in this ecosystem including herbaceous plant communities as well as assemblages dominated by shrubs or trees. In despite of the high amount of studies about restinga vegetation there are many gaps, including about knowledge of ant fauna, which have important roles in ecosystems. Therefore, it is important to make the species survey and investigate what patterns and processes occur in Restingas ant communities, so, we decided to investigate: (i) if edaphic ant community respond to the complexity of different restingas phytophysionomies, (ii) if the arboreal ant community respond to the structuring of this vegetation, (iii) what the ant fauna (species richness and composition) associated to shrub and tree plants in two kinds of restingas (Restinga Forest and Restinga de Moitas) and (iv) if sand dunes ants respond to daily temperature variations. We conducted field studies between 2016 and 2018 in the Conceição da Barra's APA and Itaúnas State Park in Espírito Santo province. We collected a total of 84 ants species, and we obtained as a new records to the Espírito Santo the genus *Kalathomyrmex*, *Monomorium*, *Mycetophylax*, *Nesomyrmex* and *Xenomyrmex* and the species *Cephalotes umbraculatus* and *Kalathomyrmex emeryi*. The low ant species richness may be due to the tensors presents in restinga and also because these environments are relatively new, arisen after Holocene events. We verified that the ant richness is lower in the frontal dunes and that does not vary between the restinga "aberta" and restinga forest, but the composition varied among the three phytophysionomies. This results reinforces the zoning present and the importance of the maintenance of these different communities. In the second question, we did not find a relationship between arboreal ant diversity and the complexity of the vegetation. This was due to the dominance of the genus *Protium* and its aggregated distribution, which makes the plant community homogeneous. There also was no significant differences in ant species richness found in both phytophysionomies. Finally, we also noticed that dune ants abundance, richness and composition vary with increasing temperature during the day. This result may be due to the fact that generalist species foraging throughout the day while the thermophilic were sampled only during the warmer period. These results demonstrate that the patterns and processes exhibited by ant communities in coastal environments are peculiar and linked to the characteristics of each phytophysionomy. (UFES-FAPES-IEMA-PEI).

3.3.89 DIVERSITY AND ECOLOGICAL PATTERNS OF ANTS ASSEMBLIES IN RESTINGA ENVIRONMENTS

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Ecological patterns about restinga ant communities are still little known. Previous studies demonstrated the presence of endemic and endangered ant species, although the process shaping these assemblies are poorly investigated. Thus, we tested the assumption that the increase in vegetation heterogeneity promotes an increase in ant species richness. The experimental design was developed in the phytophysiology restinga forested in the State Park of Itaúnas-ES, where 10 plots of 20x20m were established. We sampled ants using a set of three pitfalls without bait on all trees that presented PAD above 12.5cm. We collected a total of 38 ants species of, among them the specie *Atta robusta* that is endemic to restinga areas and is threatened with extinction. Myrmicinae was the most representative family with eight genera and 12 species, followed by Formicinae (three genera and 11 species), Pseudomyrmecinae (one genus and eight species), Dolichoderinae (three genera and four species), Ponerinae (two species) and Ectatomminae (one specie). The higher representativeness of the subfamily Myrmicinae is due to this is the most diversified within the Formicidae. Among the most representative genera, *Camponotus* has a higher diversity of species and adaptations, being common in open areas like restinga; already *Pseudomyrmex* are typical of the arboreal fauna, which can explain its higher representativeness. *Azteca sericeasur* was the most abundant, this is a specie common in the forest canopy. *Cephalotes umbraculatus* and *Xenomyrmex* sp.1 (antweb1032694) have in this work the first record for the Espírito Santo province. *Cephalotes umbraculatus* is a species typically of Amazonian areas, having a Neotropical affinity, with distribution in Mexico, Bolivia and North of Brazil, and was sampled in this study. *Xenomyrmex* is a rare genus with only four known species, two occur in Brazil, but little is known about the biology and ecology of the group. The assumptions that heterogeneity promotes increase on ant diversity was not confirmed when the total plant community was used in the analyzes. However, when the genus *Protium*, which presented high abundance (47.2%), was removed from the data, the pattern can be observed. These results demonstrate the ant diversity presented by the restinga environment studied, indicating that these environments still preserve an important, but little known part of our biodiversity. Thus, the results shows that patterns and processes that determine biological communities can be influenced by natural homogenization of environments, where the local dominance of plant groups, in this case the genus *Protium*, is the structuring factor of ant assemblage.

3.3.90 THE ANTHROPOGENIC DISTURBS DECREASE ANT FUNCTIONAL DIVERSITY ON THE AMAZON RAIN FOREST

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Anthropogenic activities are among the main drivers of biodiversity loss. Despite the extensive taxonomic information available on the effects of environmental changes on biodiversity, less is known about those effects on the functional role of organisms in ecosystems. The functional diversity is linked to several ecological processes and could be considered an important descriptor of the impacts on local ecosystems. In this sense, we aim to understand how the simplification of habitats, caused by anthropogenic disturbances, affects the functional diversity of ants in the Amazon Rain Forest. We hypothesize that there will be lower functional diversity with increasing levels of disturbance. We measured 13 functional traits that are linked to complexity and structure of the habitat (width of head without eyes, width of head with eyes, interocular distance, length of head, length of clypeus, width of eye, length of eye, length of scape, length of jaw, length of Weber, pronotum width, femur length and tibia length). We take the measurements from 1350 individuals from 264 species of ants, collected in 192 transects with different levels of anthropogenic disturbance in the northeast of the Amazon Rain Forest (measured by aboveground plant biomass): i) primary forest without disturbance, ii) burned and felled, ii) secondary forest, iv)reforestation, v) pasture, and vi) crops. As hypothesized, we found that functional diversity of ants decreases in environments with a higher level of disturbances. Therefore, forest areas maintained a higher diversity of functions than those areas that suffered anthropic impacts. This result indicates that disturbances caused by human activities act as a filter by selecting functional traits in ant communities. The strength of this filter seems to be related to the environmental complexity. Pastures and crop areas have higher environmental homogenization, which guide the ant attributes to be more similar and, as a consequence, ant community in those areas exert a lower diversity of functions. On the other hand, forest areas have greater complexity and environmental structure, which favor the occurrence of attributes to avail such complexity, and consequently maintained the ecosystem functioning. The loss of functional diversity affects the integrity of ecological processes, due to the exclusion of characteristics that are essential to the maintenance of ecosystem processes, such as, environmental productivity and nutrient cycle. Thus, we emphasize that in addition to the loss of species, anthropic disturbances can also lead to the loss of functional diversity that is fundamental to functioning and maintenance of ecosystems.

3.3.91 ANT COMMUNITY PERSPECTIVE ON THE HETEROGENEITY OF URBAN LANDSCAPES

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During the last decades research with focus on urban landscape ecology has been growing exponentially. Cities are comprised by heterogeneous mosaics of land uses that differ in physical, economic, political and social aspects. This complexity makes it difficult to define which classes of land use types should be considered when characterizing species perspective of urban landscapes. The ants are among the most common organisms in urban areas and can play an important role in the maintenance of ecosystem services in this region - such as water infiltration and soil productivity - at the same time that many species are consider urban pests. In this study we aim to understand how ant communities perceives the heterogeneity of urban landscapes. Using pitfall traps, we sampled ants in a medium-sized South American city 13 squares and we also calculated the percentage of 17 classes of urban coverage, -including 6 classes of vegetation (e.g. gardens, forest patches, street trees) and 8 classes of urban buildings (e.g. streets, houses, vertical building, commercial area and industrial area) - in three different scales: 100m, 200m and 300m. We performed a Mantel test to assess the correlation between ant community composition and urban landscape composition on four different urban landscape heterogeneity perspectives: a. considering all classes of land use types (including all 17 classes); b. considering all classes of the built environment but grouping classes of urban vegetation (totaling 13 classes); c. considering only the heterogeneity of the urban vegetation and grouping the built environment (totaling 10 classes); d. grouping classes of the built environment in a single class and the urban vegetation in another single class (totaling 5 classes). The ant community had the strongest response when considering the heterogeneity of the urban vegetation but grouping urban building in a single class (perspective c), within the 200m scale. Such result indicates that urban ant communities perceive and interact differently with the different types of urban vegetation, while different types of urban buildings maybe are perceived similarly. Therefore, our research highlights that the management of vegetation in urban landscapes can play an important role in the composition of ant communities and in the services and disservices that these insects can play in these environments. (FAPESP, CAPES)

3.3.92 BIODIVERSITY SURROGACY IN RESTORED FOREST: TREE IDENTITY AND SAMPLING SEASON EFFECTS ON THE RELATIONS AMONG ANTS, PLANTS AND OTHER ARTHROPODS

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Environmental monitoring is a costly process but essential for verifying the success of environmental management used in restoring ecosystems. Biodiversity surrogacy may be useful for environmental monitoring, but are rarely used in restoration ecology. The objective of this work was to evaluate the correlation between some parameters of the plant communities, ants and other arthropods under the canopy of different tree species. We examine to what extent the richness, composition, and abundance of species or functional groups are correlated between taxonomic groups and whether this relationship is influenced by tree identity and sampling season. The work was carried out in a restoring area at the Atlantic Forest. Ants and other arthropods were collected using various techniques (winkler, pitfall and berlese) and plants, with a diameter at breast height (DBH) < 5 cm, were counted and identified. Samples were taken from a total of 46 individuals of four target tree species. The species richness of ants was significantly correlated with the richness of other arthropods orders in the dry season, independent of the plant identity; and in *Nectandra membranacea* independent of the season. The species composition of ants and orders composition of arthropods was significantly correlated under the canopy of *Inga edulis* in the wet season, and in *Piptadenia gonoacantha* independent of the season. We found no significant correlation between the richness, composition, and abundance of plant species among ants species and other orders arthropods. The genera richness of plants and ants was correlated under the canopy of *Piptadenia gonoacantha*. The functional groups composition of ants and plants are significantly correlated under the canopy of *Piptadenia gonoacantha* and the species composition of plants and orders composition of other arthropods are significantly correlated under the canopy of *Guarea guidonia*. The results suggest that tree identity and sampling season influence the efficiency of biodiversity surrogacy, showing that a careful evaluation of the corresponding responses of the addressed groups can provide a simpler and more robust way to monitor the success of ecological restoration. (CAPES, PIBIC-CNPq).

3.3.93 WHAT CAN ANTS TELL US ABOUT ECOLOGICAL RESTORATION? A GLOBAL META-ANALYSIS

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The development of easily observable measures of restoration success is essential for monitoring of the ambitious proposed global restoration targets (e.g. Bonn Challenge; New York Declaration on Forests). Systematic reviews with meta-analyses are a good way to evaluate the performance of different organisms in the monitoring of ecological restoration. Among the arthropods, ants have a long history in environmental monitoring. We compiled a data set and performed a global meta-analysis encompassing studies conducted in different ecosystems around the world to investigate whether richness and composition of species or functional groups (FG) of ant communities can be predicted during the restoration process. Moreover, we aimed to understand the influence of restoration technique (natural regeneration or active restoration), ecosystem type (temperate or tropical), and past land use (mining or pasture) on ant communities in areas undergoing restoration processes. Notwithstanding the varied conditions in which the studies were carried out, our meta-analysis showed that reestablishment of ant FG takes place more quickly than species richness. The recovery of ant diversity is faster in tropical ecosystems and areas under natural regeneration can have higher ant diversity than the reference areas. In temperate ecosystems, mined areas under restoration are less likely to recover the number of species than FG richness. Species and FG composition was less predictable in our meta-analysis. As the publication of new datasets is increasing, we hope that future meta-analyses can build on the present study to further describe and understand the patterns in ant communities to be used as indicators of ecosystem restoration. (CAPES, PIBIC-CNPq).

3.3.94 FOREST AREA AND LEAF-LITTER BIOMASS PREDICT TAXONOMIC, FUNCTIONAL AND PHYLOGENETIC DIVERSITY OF ANT COMMUNITIES IN RIPARIAN ECOSYSTEMS IN SOUTH BRAZILIAN GRASSLANDS

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Habitat loss and fragmentation are processes that are increasing rapidly with land use intensification. In South Brazil, conversion of natural ecosystems is threatening both forest and grassland habitats. Furthermore, disturbances as fire and grazing play a key role in grasslands management, but they may not be favorable for associated forest ecosystems. Here we explored leaf-litter ant community patterns and their relation to local habitat and landscape structure in riparian forests within a typical grassland matrix in South Brazil. We investigated these patterns with taxonomic, functional and phylogenetic approaches. It was sampled 36 riparian forests in 12 sites throughout South Brazilian grasslands. At the local scale, we evaluated variables to represent habitat structure and resource availability for ants: leaf-litter biomass, canopy openness and percentage of riparian forest (250 m buffer). At the landscape scale, we calculated the percentage of natural forested area and anthropic areas (i.e. crops, tree plantations, and urban areas) within the 5 x 5 km grid at each site. Overall, 120 ant species were recorded belonging to 30 genera. We found riparian ecosystems with less forest area and less leaf-litter biomass had lower ant species diversity, functional trait diversity, and shorter evolutionary histories. Landscape structure (i.e. natural forest and anthropic area cover) did not explain ant community patterns. Our results highlight the importance of riparian forests in South Brazilian grasslands. Protecting large riparian areas can amplify ant species diversity and lineages performing potential different ecological functions in these ecosystems. Likewise, riparian forests with more leaf-litter also have increased ant diversities. Considering the amount of leaf-litter as a proxy to forest and understory quality, the presence of cattle may be affecting the regeneration and development of forest species. Landscapes with forest-grassland mosaics in South Brazil need different conservation strategies. Based on our results, we suggest fencing forests to avoid cattle access into the forests without excluding livestock grazing in natural grasslands in South Brazil. (PPBio Campos Sulinos, CNPq).

3.3.95 EFFECTS OF PLANT DOMINANCE OF *LEUCAENA LEUCOCEPHALA* ON A COMMUNITY OF SOIL ANTS

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The plant competition for limited resources can influence the community composition and determine the dominant species in a habitat. Given the usual traits of invasive species (e.g. high reproductive capacity, high resilience, and high competitiveness), they commonly suppress native plants and become dominant in some communities, reducing species richness and changing ecosystem processes. *Leucaena leucocephala* is a leguminous native tree from Central America that is now widely spread across Brazilian territory. It has some typical attributes of invasive species, such as allelopathic potential. Some studies have already shown the influence of plant dominance in the ecosystem diversity, but little is known about its effect on community composition. Considering that ants represent 10% of the biomass in some habitats and its composition is influenced by the ecosystem heterogeneity, we aimed to analyze the effects of *Leucaena leucocephala* dominance on the community of soil ants. For this, we selected two environments inside the Federal University of Minas Gerais, which are: “Estação Ecológica” an altered area of semideciduous forest, and “Bosque da Música”, which represents an area with high dominance of *Leucaena leucocephala*. We installed three transects with four pitfall traps, totalizing 12 pitfalls per area. The pitfall traps stayed for 2 days. The biological material collected was separated selecting only ants, which was then identified at least at the gender level, and also in morphospecies. We analyze our data considering richness, abundance, and beta diversity of both communities (Sorensen index and NMDS). There were no significative differences of richness and abundance between “Estação Ecológica” and “Bosque da Música”. This is probably due to conservation level of “Estação Ecológica”, which is a very altered area of forest, surrounded by roads and building. Nevertheless, the community composition presents highly differences, mainly due to species turnover (94.91%). The most abundant ant genre in Bosque da Música was *Pogonomyrmex* (41.35%), probably because most species are seed harvesters, and *Leucaena* trees produce large amounts of seeds. This same genre represents only 2% of the total individuals collect at Estação Ecológica. The most abundant genre in this site was *Acromyrmex* (32.37%), probably because they are leaf-cutting ants, that cultivate fungus, and are more successful in places with a more diverse community of plants. Our results show that the composition of ant community is highly influenced by the environment, which emphasizes ants as great study model for ecosystem processes.

3.3.96 SOIL FAUNA RELATIONSHIP WITH THE HABITAT STRUCTURE IN A DRY TROPICAL FOREST IN REGENERATION

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The fauna of the soil comprises in a community of organisms that inhabit the soil at some stage of its life. This fauna includes the invertebrates that are one of the most diverse groups of the Earth, specifically the ants in which it performs diverse ecosystemic functions. However, due to the anthropic actions, this diversity is decreasing mainly in tropical habitats, with that, the recovery of these areas becomes an important factor for the reestablishment of these organisms. However, it is not known how this occurs in tropical forests and if there is an influence of the habitat structure on these individuals. Thus, this study aimed to understand how the structure of habitat influences abundance. The study was carried out in the Mata Seca State Park, located in the municipality of Manga-MG, in an abandoned central pivot area in the year 2005. In this area, five linear transects were constructed and each distance of 100m from the edge to the interior was made a parcel 10mx10m and from the edge to the forest, a distance of 50m, to the all were built seven parcels. For the fauna sample, we used pitfalls and for the habitat structure we selected all individuals with a chest circumference (CAP) above 15 cm and using as parameter the density, basal area, richness and height. As a result, it found 12,295 arthropod specimens, of which 7554 individuals belonged to the Formicidae family, this can be explained because this group has many opportunistic and generalist species, besides being dominant in a large part of terrestrial ecosystems and constituting, even in secondary forests. This group still accounts for more than half of the total biomass of arthropods found in tropical forests and is still considered primary or secondary seed dispersers depending on the site. In relation to the effect of the habitat structure on the abundance of the fauna, the soil was positively correlated, since the increase of the complexity of this environment provides a lower luminosity and a higher humidity, this humidity is directly related to the exposure of the invertebrates, since moisture content affects physiology, longevity, development and oviposition, compromising the richness and distribution of arthropods. In addition, this complexity provides better hiding ways for arthropods to avoid predators, larger foraging sites as well as for plants to protect against extreme temperature conditions (UNIMONTES)

3.3.97 ANT ASSEMBLAGES FUNCTIONAL DIVERSITY IN FLOODED AND UNFLOODED FORESTS AT CENTRAL AMAZON

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The flood pulse of the main rivers is a natural disturbance that affects terrestrial species. The flood creates temporary flooded forests, named *várzea* when they are periodically flooded by nutrient-rich rivers. In this study we evaluated the effect of periodic flooding on occurrence, richness, composition and functional diversity of ant assemblages during flood and dry season. We collected ants in 14 transects located near Juruá River in Carauari, Amazonas, using terrestrial pitfall-traps, Winkler extractors, vegetation beating and arboreal pitfall. We measured thirteen morphological traits associated with foraging and habitat use. We used Analysis of Variance to compare univariate taxonomic diversity metrics (occurrence and species richness) between periods (flooded and unflooded) and forest types (*várzea* and terra-firme forests) by each stratum (soil/litter and arboreal). Species composition was compared by Multivariate Permutation Analysis. We calculated three functional diversity indexes for each transect: functional richness (FRic), functional evenness (FEve) and functional dispersion (FDis). We used the standardized effect size (SES) of the three functional indices to control possible effects of differences in species richness between transects. Finally, we compared ant size, leg-body, weighted by the occurrence of the species between forest habitats. In general, the sampling period was not related to any metric used for both taxonomic and functional diversity. Terrestrial ants were more frequent and diverse in *terra-firme* compared to *várzea* forests. Conversely, arboreal ants tend to be more frequent in *várzea* compared to *terra-firme* forests, but the species number was similar. FRic was similar in both forests types. On other hand, FEve and FDis were higher in *terra-firme* than *várzea* forests. For terrestrial species, the indices were similar among forest types. However, separately, two functional traits showed differences between forests. Arboreal ants tend to be larger in flooded forests. On the other hand, terrestrial ants tend to have proportionally smaller legs in terra-firme forests. Together, these results suggest that floodplain forests are more selective habitat for arboreal ants, since larger bodies have less desiccation risks and that terrestrial ants exploit the available resources in the litter of terra-firme forests, since proportionally smaller legs facilitate the locomotion between the interstices of the litter. The relative lower diversity of ants in the *várzea* forests suggests that flooding period affects important factors for ants establishment, such as nesting and foraging, and causes changes in morphological traits related to specific functions of the species. (INPA, UFAM, CAPES, The Darwin Initiative)

3.3.98 ARBOREAL ANT FAUNA IN AREAS OF AMAZONIAN RAIN FOREST SOUTHWEST OF PARÁ

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In tropical forests, studies of ant assemblages have mostly focused on the ground. Although these studies have significantly changed our taxonomic and ecological knowledge of ants, an important component of the ant fauna is often poorly sampled – the arboreal ants. In tropical forests, canopy fauna has been considered one of the last biological frontiers; however, even in the understory where ants can be easier surveyed, so far few studies have been done. Here, we evaluated the community of arboreal ants in the understory of a large secondary forest remnant in the Amazon, located in the municipality of Itaituba, Pará, Brazil. For ant sampling, we established three transects of 500 m in length, between the rainy and dry season period of the region (June 2018). We marked 10 sample points along each transect, equidistant 50m, where we placed four pitfalls (2 x 2 m) on the vegetation at 1.5 m from the ground; pitfall traps were set for 48 hours. We used urine solution (30%) as an attractive solution. We used Jackknife1 to estimate sample coverage, and evaluated patterns in diversity and species composition among transects using Shannon index and cluster analysis (based on Bray Curtis dissimilarity), respectively. We recorded 72 species, 24 genera and nine ant subfamilies. Myrmicinae showed higher species richness and frequency of occurrence (nine genera; 30 species; 126 records), followed by Formicinae (four genera; 16 species; 129 records), and Dolichoderinae (three genera; 12 species; 45 records). The richest genera were *Camponotus* and *Dolichoderus* (ten species each), *Cephalotes* and *Pheidole* (seven species each). The most common genera were *Camponotus* (106 records), *Crematogaster* (84 records), and *Dolichoderus* (43 records). The highest species occurrences, diversity, and species richness were recorded in transects with greater environmental heterogeneity and/or vegetation height. We found higher similarity among transects with similar vegetation structure. Our results extend the known geographical distributions of arboreal ants, as well as the representativeness of this segment in ant collections. (Cnpq/PIBIC)

3.3.99 HOW DO FOREST AMOUNT AND ISOLATION PROMOTE CHANGES IN ANT COMMUNITIES?

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Habitat fragmentation in an old process in the Atlantic Forest, that formed several vegetation patches separated by different types of matrices. The structure of the remaining habitat can difficult species flux among patches, which may impact species diversity. Species turnover depends on how isolated the fragments become after fragmentation and on the dispersal capacity of species. The change in species diversity can also be a consequence of vegetation loss that leads to loss of resources for several species, but often these consequences cannot be seen in the short term. We investigated how changes in area amount and in the isolation of forest patches across years of habitat fragmentation impact ant communities in the long term. We tested the following hypotheses (i) ant species richness decreases in the long term, (ii) ant species composition changes due to higher isolation of forest patches, (iii) ant species composition in closer patches is more similar. We sampled ant communities in 17 forest patches in Viçosa, Minas Gerais, in 1995, 1996 and 2010. We estimated the area of each forest patch in each year, and calculated changes of isolation among them across these years. We analyzed the difference in richness and composition between forest patches across these years and calculated changes in beta diversity. Species-area relationship was consistently observed throughout time, with no differences among years, disregarding changes in patch area and isolation. There was no change in ant species composition when comparing 1995 to 1996, but the ant community changed after 15 years. Area amount and isolation of forest patches changed, but this did not interfere in the flux of species among them. Therefore, differences in ant species composition was only observed in the long term, and this difference was not due to habitat amount and isolation of forest patches. Less isolated fragments do not necessarily have more similar species. We suggest that species promoting changes in composition are those present in the matrix surrounding forest patches. The matrices around the fragments are composed mainly of pastures where there may be several generalist species which easily adapt to forest areas and may promote changes in composition. (Capes/CNPq/FAPEMIG)

3.3.100 RESPONSES OF FUNCTIONAL DIVERSITY OF ANT ASSEMBLAGES TO ENVIRONMENTAL CHANGES CAUSED BY EUCALYPT PLANTATIONS IN NORTHEASTERN ARGENTINA

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Understanding the factors and mechanisms that shape biotic assemblages is an important challenge in community ecology. Currently, several studies have used trait-based approaches to gain a better understanding of functional community structure and their responses to environmental changes. Tree plantations have become one of the fastest growing land uses in recent decades, and it has increased rapidly in pampean grasslands of central Argentina. Environmental and habitat structure changes that occur along forest cycle mediate key processes that govern the assemblage of insect communities. We assess the effect of eucalypt forest cycle on functional diversity of ant communities by analysing the relationships between environmental variables and ant functional traits. We selected eight plantation ages, three replicates per age and three protected grasslands as reference habitat. At each replicate, four pitfall traps were established to sample the epigaeic ants, during austral summer. Environmental variables that are expected to change with plantation age were measured: temperature, leaf litter depth, forest density, canopy cover, humidity, plant diversity (Shannon index) and bare soil cover. We used the Rao quadratic entropy index (RaoQ) to calculate the functional diversity. In addition, we estimated functional dissimilarity (β Sorensen, relative to the native habitat) and their components (nestedness and turnover) considering morphological traits related to feeding and foraging strategies. The fourth-corner analysis was used to identify associations between environmental variables and functional trait composition. We identified 73 ant species/morphospecies in both grassland sites and eucalypt plantations. Although we found that functional diversity increased with plantation age, functional dissimilarity increased from four-year eucalypt plantation which match with canopy closure. The main component of functional dissimilarity was nestedness indicating ant species loss from grasslands as eucalypt plantation age increases. Regarding fourth-corner results, we found a positive and strong association between temperature and head and mandible length. In addition, plant diversity had a positive and strong association with femur and scape length. In contrast, canopy cover and plant diversity had a negative and strong association with eye width and Weber length, respectively. In conclusion, although functional diversity increased along the eucalypt forest cycle, our results revealed that ant trait composition of grasslands were affected negatively by the environmental changes that occur along eucalypt forest cycle. Our findings suggest that ant morphological traits could reflect the ability to persist in new abiotic conditions providing by monoculture plantations and, consequently, may be an adequate tool to provide guideline for commercial plantation

3. ORAL & POSTER ABSTRACTS

management. (IEGEBA-CONICET, CYCITTP-UADER)

3.3.101 VARIABILITY ON THE SPATIAL AND TEMPORAL STABILITY ON SOIL AND GROUND-DWELLING ANTS IN AN AMAZON-SAVANNA ECOTONE

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The understanding of species distribution in different spatial and temporal scales is one of the major goals of community ecology. Despite that, there is still little knowledge on how community patterns of ant species that nest and forage in distinct strata (e.g. arboreal and ground) would change in relation to spatial and seasonal variations. In most Neotropical ecosystems, there is a marked vertical stratification between arboreal and ground dwelling ants. However, is not well known how ants inhabiting different strata would respond to seasonal variations on the environment. It is reasonable to state that arboreal ants should be less exposed to climatic variations, as their shelter resources (mostly wood-boring beetle cavities) are often more stable in space and time than the ones available on the ground. Here, we asked the following questions: A) Do arboreal and ground ant communities respond differently to variations in the sampling scale (i.e. local and regional)? B) Is the effect of seasonality the same for arboreal and ground ants? This study was performed in an ecotone between the Amazon and Cerrado biomes, Southeastern of Pará state, Brazil. We sampled six different areas within this region, with each sampling area consisting of a 100 meters transect divided into five sampling points at each 20 m. At each point, we sampled ants using arboreal (5 on each tree) and ground pitfalls (four), that were left in the field for 48 hours. The arboreal pitfalls were filled with a solution of water and human urine (1:3), while the soil pitfalls were filled only with water and soup. Overall, we found 176 species of ants, and the number of species found on the trees (71 species) was less than half of the ground dwelling species (154), with 50 species using both habitats. While there was a spatial variation on species richness for both arboreal and ground ants, there was an effect of seasonality only for the soil ant communities, with significantly more ant species during the dry season. The additive partition of diversity also showed similar patterns for ground and arboreal ants, with the diversity between zones (B2), and between seasons (B3), explaining most of the variation of ant diversity. Our data show the importance in taking into consideration the potential differences in the responses of ants living in different strata within habitat to gather a better understanding of the dynamics of ant communities in space and time. (CAPES, CNPQ)

**3.3.102 DISTANCE-DECAY OF COMPOSITIONAL
SIMILARITY IN GROUND BUT NOT IN CANOPY ANT
ASSEMBLAGES IN A TROPICAL RAINFOREST**

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Both decreases in compositional similarity with increasing geographic distances between sites (i.e. distance-decay relationship) and vertical stratification of species composition are key issues in ecology. However, the intersection between these two trends is just beginning to be investigated. Most studies have shown that ant assemblages are vertically stratified in tropical forests since the environmental conditions of the canopy differ substantially from those of lower strata. At the same time, the taxonomic similarity of ants at ground level decreases with increasing geographic distance. Here we use the same comprehensive sampling methods in the canopy and the ground level in a tropical rainforest remnant on the coast of the Gulf of Mexico to evaluate for the first time a distance-decay relationship within vertical strata in insect assemblages. We found that the ant assemblage was vertically stratified; ant species richness was higher at ground level than in the canopy, and the species composition differed between the two vertical strata. Moreover, we observed that β -diversity increased with geographic distance at ground level, but not in the canopy strata. However, contrary to our prediction, there was less species turnover (lower β -diversity) between vertical strata than between trees. These findings reflect differences in the dispersal capacity and nest habit of ants from each vertical stratum. In short, our results illustrate the importance of sampling more than one vertical stratum to understand the spatial distribution patterns of biological diversity in tropical rainforests. (CONACYT-Mexico)

3.3.103 DISTRIBUTION OF ANTS IN AN ELEVATIONAL GRADIENT IN MEXICO AND ITS RELATIONSHIPS WITH TEMPERATURE

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Species distribution on earth is not random, as it relates to several environmental conditions that change with space and to which biological organisms are adapted. These conditions given by biotic or abiotic interactions. On mountains, it is common to find distinct patterns of species richness in relation to elevation, since many environmental variables change with elevational increase. For instance, temperature diminishes with elevational increase which diminishes primary productivity (plants), that also diminishes with elevation. Changes in temperature are also relevant for ectotherms (e.g. ants), which are sensible to temperature changes, by changing activity and foraging periods, reproductive life cycles or survival. Ants are a group of organisms that often represent high species richness and biomass in various terrestrial ecosystems. In this context, we asked if: does elevation or temperature (mean, maximum, minimum) explain species richness in an elevational gradient? We sampled ants along an elevational gradient (between 450 - 3450 m a.s.l), on the humid slope of the Pico de Orizaba Volcano (~5,600 m a.s.l.). We established 13 sampling points along a transect, separated ~ 250 m in elevation. On each sampling point, we placed 10 pitfall traps baited with human dung. We measured temperature on each sampling point using data loggers. We found 46 ant species in 11 of the 13 sampling points; in two elevations, we did not find any ant species. Maximum and minimum temperature were highly correlated with elevation. Thus, we selected maximum temperature, since it is highly related to ant foraging activity. The higher the temperature, the higher the species richness (in a well-adjusted model), as we expected. Then, it seems that temperature is the most important driver in ant species distribution in the mountain studied. It is important to understand species distribution and its relation to environmental variables, such temperature, because it would help to better understand organism responses to global climate changes (i.e. temperature increase). Therefore, mountains resemble important laboratories to understand environmental relations with biodiversity in face of these global changes. (INECOL, CONACYT - Mexico)

3.3.104 DISTRIBUTION PATTERNS OF THE NEOTROPICAL ANT, *AZTECA TRIGONA*, ON BARRO COLORADO ISLAND IN PANAMA

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Anthropogenic disturbances negatively impact the biodiversity of tropical rainforest communities. Understanding how communities will be affected by such disturbances is important to help us better plan for conservation and restoration strategies. Arboreal ants act as an ideal focal group to study the impacts of anthropogenic disturbance as they account for 50% of the arboreal biomass in the canopy acting as key ecological components therein. Predicting what maintains high abundance of numerically and behaviorally dominant species and how they are affected by disturbances can help us better assess the impact of arboreal ants on biodiversity within changing landscapes. *Azteca trigona* is an abundant canopy species that is highly territorial and limits access to localized canopy resources. This species complex build pendulous carton nests that house thousands of workers and are easy to find in the forest. Personal observations have revealed a higher density of nests in areas of disturbance and secondary forests, although no studies have quantifiably assessed these patterns. We conducted an island-wide survey to estimate the number of *A. trigona* nests on Barro Colorado Island in Panama. We asked 1) if the density of *Azteca trigona* nests differed across BCI and 2) if topography, soil nutrients, geology, or forest age/tree height predict the patterns of observed nest density on BCI? We additionally surveyed *A. trigona* nests in liana removal plots on the Gigante Peninsula in the Barro Colorado Natural Monument to assess how canopy disturbance affects the density of *A. trigona* ants. Preliminarily, we observed 500 *A. trigona* nests on BCI and in the liana removal plots. Our preliminary results suggest that soil classification and forest age predict the density of *A. trigona* nests on BCI. Additionally, there was a higher density of *A. trigona* nests in liana removal plots than in control plots. Our results suggest that *A. trigona* densities are higher in younger forests and areas of intense disturbance. Given that *A. trigona* aggressively outcompetes for food and probably nest resources, their higher density in more disturbed areas may ultimately compound the effects of anthropogenic disturbances.

3.3.105 HOW A DOMINANT NEOTROPICAL ANT INFLUENCES ARBOREAL ANT ACCESS TO NEST RESOURCES

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Competitive interactions shape community structure. In communities where consumer abundance is high, but space is limited, competition is expected to be intense. The tropical rainforest canopies provide such a setting for certain taxa, and ants are ideal organisms to study these community dynamics as they account for 50% of arboreal arthropod biomass. Many species of arboreal ants depend on opportunistically available hollow twigs and other small cavities for nest sites and nest occupancy is likely determined in part by intra- and interspecific aggressive interactions. Thus, for arboreal ants, nest site availability may play a large role in structuring arboreal ant species distributions. On Barro Colorado Island in Panama, the arboreal ant, *Azteca trigona*, is a common and aggressive species that outcompetes at bait resources and influences presence of certain dominant invertebrate species. However, most evidence for this is based on behaviors at artificially enriched food resources (baits), and the results of such studies are highly variable. To assess if *A. trigona* influences species presence and access to nest resources, we conducted ant surveys in 20 *Dipteryx oleifera* trees (10 with and 10 without *A. trigona* presence) and set up 20 artificial nests in each. We asked if 1) species richness and composition differs in trees with *A. trigona* and 2) if ant colonization of artificial nests differs between tree treatments. We hypothesized that community structure and nest usage is mediated by the presence of the behaviorally and numerically dominant *A. trigona*. Based on preliminary results we found that species richness and composition did not differ in control versus *Azteca* present trees. However, nest occupancy in *Azteca* trees was on average lower than in trees without *Azteca* and nest occupancy in *Azteca* trees was largely contributed by *A. trigona* workers. Our results suggest that *A. trigona* do not influence species richness or composition in individual trees, but when present, they limit access to localized artificial nest resources.

3.3.106 THE LITTLE THINGS THAT RUN THE WORLD ARE ALSO INVOLVED IN THE INVASIVE PROCESS: FIRST EVIDENCE OF SECONDARY DISPERSAL BY ANTS IN INVASIVE PLANTS

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Ants are involved in several relevant interactions with plants. Some ants are the main dispersers of plants known as myrmecochores; other plants with fleshy fruits that are primary dispersed by vertebrates can be secondary dispersed by ants. Invasive plant species are highly distributed in diverse ecosystems and cause severe problems in the ecosystems they inhabit. It is poorly known if ants can be secondary dispersers of invasive plants. We thus asked the following questions: (1) do ants interact with invasive plant diaspores (2) is the ant assemblage that interact with intact and manipulated fleshy fruits from native and invasive species different and (3) do ants disperse the diaspores from native and invasive plants? The study was performed in Mountain Chaco Forest from central Argentina. We selected three sites and four plant species. One native (*Celtis ehrenbergiana*: CE) and three invasive for this region (*Lantana camara*: LC, *Ligustrum lucidum*: LL, and *Pyracantha angustifolia*: PA). In each site and for each species we performed parallel transects with intact and manipulated fruits (simulating pecking by birds beak with a forceps). We performed five stations by transect with ten fruits in each one (separated by 10 m). These stations were visited hourly in a sunny day (9 to 19 hours) to register ant species and interactions. Simultaneously, in another pair of transects with five stations (also separated by 10 m) an exclusion experiment was settled for 24 hours: ten intact fruits were freely offered and ten fruits were collocated inside wired cages that impeded vertebrates to make contact with fruits but allowed ants to freely go in and out. Wholly, we registered twelve ants species from three subfamilies (Myrmicinae, Formicinae and Ponerinae) interacting with the fruits. A higher number of ants and a different assemblage interacted with the native species (CE: 10) compared with the invasive ones (LC: 6; LL: 4; PA: 4). Also, we registered a higher number of interactions between ants and plants when the fruits were manipulated. We identified two ant species as dispersers of these plants: *Acromyrmex crassispinus* and *Pheidole cordiceps*; another ant species had a localized effect on fleshy fruits and also could enhance dispersal process. Dispersal by ants was important for all the studied species. Taken together, our results evidence that native ant species interact with exotic fleshy fruits and might promote the invasion process. (CONICET, FONCyT, SECyT-UNC, CNPq, FAPESP)

**3.3.107 CORRIDORS OF DISPERSAL: EXAMINING HOW
LANDSCAPE INFLUENCES THE POPULATION
GENETICS OF A *TRACHYMYRMEX*
FUNGUS-GROWING ANT SPECIES**

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Fungus-growing ants (Formicidae: Attini: Attina), prevalent throughout much of the New World, have been central to advancing our understanding of symbiotic species networks. Of the ca. 250 described species, *Trachymyrmex* cf. *zeteki*, has been included in a range of research topics. Because of this, some natural history is well understood like microhabitat, queen mating frequency, symbiotic relationships. However, we have limited knowledge of its dispersal and population ecology. Therefore, our ability to sufficiently understand how gene flow influences ecological and evolutionary patterns in *T. cf. zeteki* is currently lacking. We address this knowledge gap by describing the genetic population structure and identifying landscape features influencing it with next generation sequencing and landscape genetic methods. Specifically, we are testing whether population structure is influenced by distance and, given that colonies are most commonly found on creek embankments, whether creeks are used as corridors for dispersal. To accomplish this, we use double digest restriction-site associated DNA (ddRAD) sequencing to generate ca. 15,000 loci from workers. These samples come from 120 colonies across ca. 30 km of the Panama Canal Zone. We then use environmental variables such as topology, soil type, and hydrology to understand potential dispersal corridors in this area. Our preliminary data consists of 24 colonies along a ca. 10 km transect that crosses the Chagres River in the Canal Zone. Data generated from these colonies show that there is a single genetic population with unrestricted gene flow. This result indicates that *T. cf. zeteki* has unhindered genetic exchange across bodies of water larger than the perennial and ephemeral creeks they are commonly found near. By increasing our sampling, we will be able to rigorously test whether there is in fact a single genetic population and determine what landscape variables influence the genetic population structure we observe. This work will inform future research by allowing others to consider the population ecology of creek dwelling ant species and how dispersal in the tropics influences their symbiotic relationships. (OSU EEOB)

**3.3.108 150 YEARS OF ANT COLLECTING IN MADAGASCAR:
WHERE TO EXPLORE NEXT?**

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Inventories are key to delimit species geographic distribution and to provide core material for new species discovery that will enable effective conservation and biodiversity management plans. Human activity is leading to unprecedented rates of decline in natural habitat and urgent conservation action is needed to overcome this scenario, especially in tropical developing countries, where rates of deforestation are faster than biodiversity assessment. Due to its geological history of isolation, Madagascar has high rates of endemism. The Malagasy ant fauna is no exception, with an estimated 1,200 species and over 90% endemism. However, this diversity is highly threatened: Madagascar has lost half of its forest cover in the past 50 years and deforestation is still ongoing. Here we analyzed 150 years of ant sampling in Madagascar to identify spatial and collection effort biases to predict what areas should be prioritized for future inventories. The analyses were based on over 100,000 ant specimen records from 32,781 collection events and 2,642 localities across the island. To identify well-sampled areas, we used kernel density estimation considering the number of times a given locality has been sampled and the number of traps used during each sampling period. We then used proximity analysis with Euclidean distance to estimate the distance of well-sampled areas to remnants of forest cover. Our results show that ant sampling efforts in Madagascar have encompassed almost all habitats and altitudinal ranges in the region. However, sampling has not been equally distributed and a large proportion of the island has not been sampled at all. For each of the five ecoregions on the island, we identified the top three remaining unsampled forest patches that are predicted to harbor the greatest number of undocumented ant lineages. The issue that geographic and collection effort biases influence our knowledge of species distributions is well-known in biodiversity analyses, and is corroborated by our results. Our study highlights the importance of identifying these biases to avoid misleading conclusions. We believe that future surveys in these target areas in Madagascar can uncover yet unknown ant biodiversity, contributing to the management and conservation plans in this threatened biodiversity hotspot. (CAS, NCSU, NSF)

3.3.109 SPATIAL PATTERNS IN TAXONOMIC DIVERSITY OF LEAF-LITTER ANT ASSEMBLAGES ALONG AN ELEVATIONAL GRADIENT IN VERACRUZ, MÉXICO.

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Elevational gradients represent striking scenarios for better understanding diversity patterns because condense high environmental variation into a small geographical area. Ants are strongly affected by changes in environmental factors so have been commonly used as an important monitoring group in macroecological studies. Despite widespread interest in the causes of elevational-diversity gradients, empirical studies have focused mainly on patterns of species richness. In contrast, surprisingly little is known about the patterns in community composition (β -diversity) across elevations. Thus, the aim of this work was to identify alpha and beta taxonomic patterns of leaf-litter ants along an elevational gradient located in the central region of Veracruz, México. We selected eight elevational band along an elevational range from sea level to 3500 masl. In each band, we shifted 20 plots of 1m² of leaf-litter and processed in Winkler sacks for collecting ant species. We build a matrix with the p sites and n species containing the occurrence frequencies. For alpha diversity, we pooled all species observed per band. In terms of beta, we constructed a similarity matrix using the Sorensen index; therefore, we performed a cluster analysis. Significance of groups were evaluated using the SIMPROF test incorporated in PRIMER-e software. We collected 17,700 individuals that belonged to 120 species from 44 genres of 7 subfamilies. The highest richness was observed at 500 masl (61 spp) and dismissed toward the extremes of the mountain. We did not find any species at 3500 masl. According to cluster analysis, we obtained four groups: 1) sea-level band, 2) bands between 500 and 1000 masl, 3) bands between 1500 and 2500 masl. and 4) band at 3000 masl. Thus, results in this study adjust to hump-shape pattern also reported in other taxa. This pattern is commonly associated to geometric constraints. Locally, this pattern could be explained by a lower establishment of ant species due to the frequent hurricanes at sea-level band and harshness condition at high altitudes. We found a high turnover of species composition between elevational bands. Results in this study establish a promising scenario to evaluate the impacts of global warming on species. Finally, these results highlights the importance of set up a conservational plan in which many parts of the gradient are included to sustain high regional diversity of leaf-litter ants.

3.3.110 SAMPLING BIAS IN MULTISCALE RESPONSES OF LANDSCAPE COMPOSITION ON ANT DIVERSITY

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Recent studies have shown that there are several potential sources of variation that can influence the reliability or comparability of data when evaluating the ecologically relevant spatial scale (i.e., scale of effect) for a biological response. For instance, since sampling methods differ in their efficiency or show high specificity to capture certain organisms, it could which may affect the inferred relationship between the community response and landscape composition. In this study, we evaluated the scale of the effect on ant richness based on two variables of landscape composition (i.e., forest cover and landscape heterogeneity) considering the information obtained by different sampling methods (i.e., winkler, pitfall, honey baits tuna baits and beating). For this, we carried out ant samplings in 16 landscape units within a Mexican tropical rainforest and analysed the relationship between species richness and landscape composition through 12 different spatial scales (from 50 m to 1000 m). We found that scale of effect of ant richness depends on the sampling method used. However, the Winkler extractor was the only method that individually showed a relation between ant richness and landscape composition metrics. In addition, forest cover and landscape heterogeneity showed to be associated to species richness in a wide range of spatial extents. Our findings suggest that the scale of effect depends not only on the environmental variables that are evaluated but also on the sampling method used. In short, we emphasized the importance of considering that the information obtained by the sampling method can bias the relationship between landscape composition and species richness and, therefore, it needs to be considered as another source of variation in multiscale studies.

3.3.111 SPATIOTEMPORAL PATTERNS OF THE ANT COMMUNITY IN MONTANE FOREST ISLANDS

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Naturally fragmented landscapes are good systems for evaluating patterns and mechanisms that determine the distribution of species in in-land environments without confounding effects of anthropogenic fragmentation and habitat loss. This work aims to evaluate (1) the spatial and temporal patterns of ant communities in montane forest islands, and (2) how ant assemblages use the habitat differently. Thus, we evaluate these patterns by deconstructing the ant community into forest dependent or matrix tolerant species. Fourteen forest islands located in the Serra do Cipó (MG), varying in size, shape, and connectivity were sampled twice a year (during summer and winter) over two years (2014 and 2015), using both soil and arboreal pitfall traps. We used generalized linear models and mantel tests to relate variables of landscape structure, forest island structure, and seasonality with richness and β -diversity metrics considering the entire ant community, and both forest dependent and matrix tolerant assemblages. We highlight that species composition (β -diversity) varied more in space than in time and that there is a correlation between geographic distance and β -diversity. We verified that the variation in species composition in time (temporal β -diversity) differed between ant assemblages. Forest dependent ants respond to the forest island and landscape structure, while matrix tolerant species are influenced only by landscape structure variables. The landscape structure determines the dispersal capacity between the forest islands for both assemblages, while the local characteristics of forest islands determine the ability to establish only for forest dependent ants. Therefore, the landscape structure acts as a spatial filter and the local characteristics of forest islands act as an environmental filter. We have shown the importance of the maintenance of this forest archipelago to metacommunity dynamics and ants diversity in montane regions. (CAPES, CNPq, FAPEMIG)

3.3.112 TAXONOMIC AND FUNCTIONAL ANT DIVERSITY ALONG THREE SPATIO-TEMPORAL DIMENSIONS IN A TROPICAL MOUNTAIN

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Understanding the several processes underlying the assembly of biological communities in space and time is central for Ecology. Here, we investigated the patterns of taxonomic and functional diversity of ants in a mountainous landscape along three dimensions: one temporal (seasonal) and two spatial dimensions, between habitats – grassland and forest habitats (horizontal dimension), and among elevation belts (vertical dimension). Additionally, we tested the effects of environmental variables (mean elevation and temperature, and vegetation cover mean) on taxonomic, and functional richness of ants. A total of 195 ant species were sampled, belonging to 50 genera and eight subfamilies. We found differences in species composition in all three dimensions, with higher levels of taxonomic β -diversity between seasons, habitats, and elevations, and an average contribution of 90% of species turnover. The β -diversities of the two spatial dimensions (vertical and horizontal dimensions) were the main components to the taxonomic diversity, with markedly different community compositions among elevations and habitats. We found a gradient in the turnover of species composition in the two spatial dimensions, indicating differences in the community at local scale on grassland and forest habitats along the elevational gradient. The changes in species richness and composition patterns were strongly influenced by factors correlated with variation in elevation (temperature decrease) and the structural habitat heterogeneity (vegetation cover mean decrease). Regarding environmental drivers, the lower temperatures found at higher elevations correlated negatively with ant taxonomic richness, while no effects of the environmental variables were observed for functional richness. Despite the high turnover of ant species occurring along spatial dimensions, the communities were functionally redundant. Functional diversity was almost entirely structured at local scales, with greater relative importance of the α -diversity component (93% of the functional diversity). The low functional beta diversity was, opposed to taxonomic beta, mainly driven by nestedness. The differences observed in the taxonomic composition of the ant community over relatively short geographic distances highlight the importance to conserve entire mountain ecosystems, maintaining ant diversity and ecosystem services. (UFMG, FAPEMIG, CNPq, CAPES)

3.4 PHYSIOLOGY, MORPHOLOGY, ANATOMY AND CHEMICAL ECOLOGY

3.4.1 GENITAL MORPHOLOGY OF MALES IN THE ANT GENUS *DINOPONERA*, ROGER 1861 (FORMICIDAE: PONERINAE)

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Ant taxonomy is largely based on worker morphology, and data on male morphology is generally scarce. This lack of information is probably due to the limited availability of identified ant males in collections, most specimens relegated to drawers or unit trays of unidentified males, and the fewer resources available for identifying them. Nevertheless, studies have revealed the value of male morphological characters, including their genitalia, for providing useful characters for taxonomy and systematics. Although some geographical variation in genitals is often assumed, the real scope is unknown. The ant genus *Dinoponera* is within the Ponerinae and contains 8 valid species. It is characterized by large workers, surpassing three centimeters in total body length, making them the largest ants in the world. *Dinoponera* males are very scarce in collections, and they are rarely collected perhaps because only few males leave the nest to search for a mate. Currently, males are known for six species, and morphology has only been described in five of them. Here we describe the genital morphology of *D. lucida* and examine patterns of morphological variation in the genitalia of four species. The specimens examined were dried and rehydrated for dissection. The genital apparatus was pulled out from the gaster using fine forceps and carefully glued to cardstock paper points mounted beneath the specimens. Until the present moment, all the species examined share long and apically rounded parameres with a basal membrane allowing them to fold; the volsella articulate with the basiparameres and a lateral finger-like cuspis volsellaris; the penis valve of aedeagus seems rounded to triangular. Several characters, specially the length and width of the paramere, and the shape of digitus volsellaris, cuspis volsellaris and ventral process of volsella, seem to vary between different species and might be varying within species, mainly in *D. lucida*. We are currently taking measurements and using morphometric analysis to describe and understand the differences within and between species. (CNPq)

3.4.2 INFLUENCE OF REPRODUCTIVE STATUS IN THE IMMUNE RESPONSE OF LEAF-CUTTING ANT QUEENS

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Insects present an innate immune response with defense cells, enzymes, and patterns that evolved with environmental pressure. This line of defense can be divided into humoral and cellular. Hemocytes are the main mediators of cellular defense and participate in the processes of phagocytosis and encapsulation. The specificity of the immune response may vary with host longevity and the possibility of being exposed more than once to the same pathogen. Ants are eusocial insects and group life, despite facilitating contamination by pathogens among colony individuals, may favor the development of immunocompetence. Queens of different species of ants have a long-life span and are therefore more likely to be exposed to the same pathogen more than once. By initiating a new colony, queens are isolated and a trade-off between reproduction and immunity can reduce investment in the immune defenses of these founding ants. Therefore, their resistance to disease may be related to their reproductive status. Thus, the aim of the present study was to verify the cellular immune response of the leaf-cutting ant *Atta laevigata* in different reproductive statuses: virgin queens (VQ), newly mated queens (NMQ) and queens mated for approximately six months (MQ). To assess individual pathogen resistance, a nylon thread, simulating a regular antigen, was introduced into the individuals' gaster and photographed, and the encapsulation rate measured using ImageJ software. Data were submitted to ANOVA statistical analysis. Morphological aspects, such as body mass and head width, were measured in order to verify correlations with the triggered immune response through the Pearson Correlation Coefficient. The MQs presented the highest encapsulation index, whereas the NMQ and VQ did not differ among them. The results suggest that the cellular defense in this species can vary with the reproductive status and the time elapsed after the mating. The investment in immune response at this stage of the life cycle may be due to the presence of workers and an initial fungus garden that will provide the necessary support to the queen. For each sample group, the morphological aspects were analyzed but did not present a relation. Because it is a pest species, basic studies on the cellular defense mechanisms of leaf-cutting ants can contribute to the clarification of the insect's immune responses and to the improvement of current control methods. (CNPQ)

3.4.3 WHERE IS THE CURE OF CANCER? THE ANSWER MIGHT BE UNDER OUR FEET

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The tropical ant *Paraponera clavata* (Hymenoptera: Formicidae) displays a diversity of foraging activities, feeding on live prey, extrafloral nectar, and plant tissues. While its venom is studied due to the presence of neurotoxins, the chemical composition from other ant's parts has not been investigated. In this context, we aimed to investigate the chemopreventive activity of aqueous extract from *P. clavata* (AEPC). Chemoprevention is the process of reversing, suppressing, or preventing carcinogenesis. Thus, we determined the effects of AEPC on growth and migration of melanoma, a type of skin cancer with high capacity to form metastases. *P. clavata* ants were collected by active search in Campo Grande, Mato Grosso do Sul, Brazil (20°30'37.40"S 54°36'55.32"O). A total of 250 individuals (~40 grams) had the venom gland surgically removed and the whole body was grounded in liquid nitrogen, extracted in distilled water (ratio 1:10 weight: volume) during two days and lyophilized. Melanoma cells from human (SK-MELL-19, 28 and 103) and mouse (B16F10-Nex2) were incubated with different concentrations of AEPC in assays of growth and migration *in vitro*, where we evaluated the cellular viability and simulated a metastasis model. The normal human fibroblast cells, MRC-5, were used to investigate possible side effects of AEPC on normal cells physiology. The total content polyphenol and flavonoids in AEPC were determined as well the antioxidant activity through *in vitro* assays. At 100 µg/mL, the EAPC reduced in 27 % the viability of SK-MELL-19, 27 % SK-MELL-28, 11 % SK-MELL-103, and 37 % B16F10-Nex2, while no effects were noticed on MCR-5. The assay of cellular migration showed that AEPC at 50 µg/µL impaired the migration of B16F10-Nex2 cells in 30% within 24 h, while no effect on cell migration was observed for MCR-5 cells. The content of polyphenol and flavonoids in EAPC was 23.5 mg Gallic acid equivalent (GAE)/100g and 3.7 mg Quercetin equivalent (QE)/100g, respectively. The AEPC exhibited activity in capturing free radicals, showing a half-maximal inhibitory concentration (IC₅₀) of 271.6 µg/mL for DPPH and 86.4 µg/mL for ABTS. These results suggest that the antioxidant activity demonstrated by AEPC is related to the effects on reduced growth and migration of melanoma. This feature might be further investigated by a transdermal drug delivery system containing AEPC to control both melanoma growth and metastasis in animal model. The complete chemical constitution of AEPC as well as the mechanisms of cell death triggered by extract are being investigated currently. (CNPq)

3.4.4 ANALYSIS OF MORPHOLOGICAL TRACES OBSERVED IN DOSSEL ANTS

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Currently, functional diversity has been the subject of many ecological works because it is a way to better explore the information previously related to taxonomic diversity. In addition, it has been widely used to predict environmental impacts and to explain how species may be correlated with ecosystem processes, taking into account morphological, ecological and behavioral aspects. In this sense, ants are part of one of the most studied groups, because from the analysis of their morphological characteristics it is possible to better understand some ecological processes and how anthropic actions influence the functional structure of other communities. Thus, an analysis of the functional diversity of a community of arboreal ants was carried out, existing in a forest fragment within an urban area, composed of native and exotic tree species. The study was carried out at the “Universidade Federal de Sergipe (Campus São Cristóvão)” and was used to collect formulations as a mixture of sardines and honey, which were erected to the highest branches of the randomly selected trees, which were at a minimum distance of 80m from each other. The collections were performed in two shifts (daytime and nighttime), the baits remained for a period of 3 hours in each shift. All ants were identified to the species level. Of the 19 recorded species, nine morphological traits were measured, being 40 individuals of the day and 48 individuals of the nocturnal period. The analyzes indicated that functional diversity was not affected by any of the analyzed variables. However, it was observed that functional redundancy was higher in native trees when compared to exotic ones. We also believe that to prevent evolutionary competition the species have separated in time/shift. (UFS, FAPITEC)

3.4.5 DIURNAL-NOCTURNAL STRUCTURE OF ANT-TREE CO-OCCURRENCE NETWORKS IN AN URBAN AREA

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Global urbanization has rapidly increased worldwide, and nowadays most humans inhabit urban centers. Though traditionally most ecological studies have focused in natural protected areas, there is an increasing recognition of the importance in studying the effects of urbanization on biodiversity. However, most of these studies are focused on species diversity patterns, usually ignoring important aspects of species interactions, like network structure and organization. In order to help solving this issue, we sampled ants on 30 trees of similar size, in an urban campus of the Federal University of Sergipe, originally covered by Atlantic forest. We further asked the following questions: (1) Is there a diel change in species composition (i.e. diurnal or nocturnal)? (2) Does the presence of extrafloral nectaries influence the species composition on the trees? (3) Is there an influence of diel changes in species composition on the ant-plant network structure? (4) Is the ant-plant individual based network structure influenced by the presence of EFNs? We found that the core of interacting species was different between the diurnal and nocturnal periods, with *Camponotus blandus* and *Cephalotes pusillus* representing the core during the day, and *Camponotus melanoticus* and *Camponotus atriceps* the nocturnal species core. We also found a significant difference between the core of species in trees with and without EFNs. Even though the overall structure of the co-occurrence networks was quite similar, they presented higher values of specialization (H_2') in the nocturnal networks, specially in the networks in which the trees presented EFNs. Interestingly, our results showed that many of the patterns of ant-plant interactions networks in this urban area are very similar to the ones found in some intact forest ecosystems. These unexpected similarity indicates that ants are resilient organisms, and their interactions with their host trees remains significant even in harsher conditions. However, it is important to state that the present study was performed in an urban area with relatively high number of trees, and it is known that distinct levels of urbanization can lead to distinct impacts on ant community diversity patterns. Presumably, the same applies for ecological interactions. Thus, it would be of great interest to measure the same network properties in areas of contrasting levels of urbanization. Only the full understanding of the influences of different factors in the maintenance of ecological interactions would foster adequate urbanization plans, that can mitigate the impacts of the fast growing rates of urbanization. (FAPITEC)

3.4.6 DO CHEATER ANTS INTERFERE THE DIASPORE-REMOVING ANTS' ACTIVITY?

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Myrmecochory corresponds to diaspores dispersion realized by ants. However, the diaspores are not found only by removing ants, but also by cheater ants. Cheater ants tend to predate the diaspores at the locality they are found, consuming only the attractive portion of them and/or damaging them, which compromises their proper dispersion (viability and germination). Moreover, to our knowledge, there are no studies investigating the influence of cheater ants on diaspore-removing ants' activity; therefore, we aimed to answer if this influence occurs. We hypothesized that the proportion between cheater ants and diaspore-removing ants interacting with diaspores would interfere the number of diaspore removals. To test this hypothesis, we set 100 artificial diaspores at 15 areas of Cerrado *stricto sensu*, in the city of Pandeiros – Minas Gerais. We collected and identified the species of all ants that were observed predating or removing the diaspores. At the end of the field experiment, we counted the number of removed diaspores. We found a total of 14 species of cheater ants, and 11 diaspore-removing ants. Among the cheater ants, three species were also observed removing diaspores (*Solenopsis tridens*, *Pheidole fracticeps*, and *Forelius* sp. 1), but as their removing activity was very low (0,80%, 2% e 0,15% respectively), they were not included as diaspore-removers in analyses. We found that the proportion between cheater ants and diaspore-removing ants did not influence removal activity, refuting our hypothesis. The diaspore-removing ants were not influenced by cheater ants, even though the proportion of cheater ants related to diaspore-removing ones was higher at 80% of the areas. The number of cheater ants varied from one to five per area, whereas diaspore-removing ants varied from one to three. Perhaps, what is most relevant to these interactions (diaspores predation and removal) is the species identity, and its respective behavior. That is because the observed cheater ants (*Camponotus vitattus*, *Camponotus blandus* e *Linepithema cerradense*) showed low aggressiveness, low recruitment, and less agility when compared with the observed diaspore-removing ants (*Ectatomma edentatum* – 65%, *Ectatomma opaciventre* – 12%, *Ectatomma planidens* – 9%, *Ectatomma brunneum* – 8% e *Odontomachus haematodus* – 1%). We conclude that, although cheater ants reduce the available number of diaspores, that does not influence the activity of diaspores-removing ants. We highlight that the cheater ants observed in this work were not aggressive species, which may allow the diaspore-removing ants to keep their function, and to not cause any prejudice to the ant-plant interaction. (FAPEMIG, CAPES).

3.4.7 EFFECT OF ENVIRONMENTAL FACTORS ON THE MORPHOLOGY OF DIFFERENT POPULATIONS OF *ODONTOMACHUS CHELIFER* (LATREILLE, 1802) IN URBAN FRAGMENTS OF THE SAVANNA

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The fragmentation of forest environments has separated them into large isolated islands, interfering with the biodiversity and biology of animals. The urban green areas harbor a high diversity of species of these insects, which contributes to the maintenance of the myrmecofauna of the biome to which the city is inserted. Considering that the ants are good models for examining interspecific allometric patterns of dimorphism in relation to body size and interrelationships between different populations, the objective of this research was to verify if changes on the leaf litter structure habitat in urban fragments of Savanna promote morphological changes in *Odontomachus chelifer* using morphometric analysis. For this, specimens sampled were analyzed in four urban fragments of Savanna in the municipality of “Campo Grande, Mato Grosso do Sul”, Brazil. Ants were collected with pitfall traps, where 51 traps were installed in an area of 100m² in each of the 26 locations sampled. In order to characterize the environmental data of the leaf litter, in each portion of 100m² were taken subsamples where pitfall traps were installed, the following characteristics were measured: the leaf litter depth (cm), the leaf litter cover (%) and the grass, the number and height of trees, the canopy cover and number and height of bushes. Twelve measurements of different body structures of 300 individuals were performed for analysis. For the statistical analysis, PAST software was used. The number of trees and the depth of the leaf litter highlighted as the factors that more interfered in the morphology. The structures of the body that were most significant in the differentiation of the populations were the body length, the head, the mesosome and gaster. We conclude that the more structured environments, with greater environmental heterogeneity and less interference of the urban mesh presented individuals morphologically closer than less heterogeneous environments. Thus, it is possible to verify a morphological difference between different populations of the same species stem from the environment that both live. (UFMS, CNPq, CAPES)

3.4.8 MORPHOMETRIC ANALYSIS OF TWO SPECIES OF *ODONTOMACHUS* LATREILLE, 1804 (HYMENOPTERA: FORMICIDAE) IN URBAN FRAGMENTS OF THE SAVANNA

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The ants are among the three most common groups of arthropods in the urban fragments of the woods, together with cockroaches and termites, and its distribution may vary along the environmental gradient. Thus, they are good models for examining interspecific allometric standards of dimorphism in relation to body size and interrelationships among different populations. To analyse these factors, the morphometric analysis is a tool which assists in the characterization of the species, there by supporting the taxonomy of this group. The most obvious modifications among the related organisms are often the differences of the shape, size, or individual parts of the body (head, mesosome, and gaster). The use of *Odontomachus* as a model of study reflects favourable biological conditions of the species to answer such questions, which are: Absence of morphological polymorphism and specific morphological adaptations for hunting in the case of the jaws and head. The objective of this research was to verify the occurrence of morphological changes between different populations of *Odontomachus chelifer* (Latreille, 1802) and *Odontomachus meinerti* Forel, 1905 located in urban fragments of the Savanna. The ants collection was performed with fall traps, where 51 traps were installed in an area of 100m² in the municipality of Campo Grande, MS, Brazil. It was realized twelve measurements of different structures of the ants body, head width, left eye width, right eye width, upper eye area, cecum area, jaw width, distance of the lower teeth, chest height, abdomen and length of the petiole. In total, there were 312 specimens belonging to both species. For discriminant analysis and pca, the PAST software was used. As a result the tests exhibited that *Odontomachus chelifer* differs morphologically from *Odontomachus meinerti* mainly by the size of the head, mesosome and gaster. Which the gaster variation represented 87% of the total variation of the two species, the head 5% of the variance and the mesosome 2%. These were the main factors that morphologically distinguished them.

Furthermore, different populations of the same species morphometrically distinguished according to the degree of isolation that they are inserted in the environment. (UFMS, CNPq, CAPES)

**3.4.9 CUTICULAR HYDROCARBONS FROM MALES AND
YOUNG QUEENS GYNES OF *Atta sexdens*
(HYMENOPTERA: FORMICIDAE)**

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Reproductive division of labor is one of the main characteristics of social insects. Several studies demonstrated a relationship between cuticular chemical compounds and queen fertility in different species of ants. In the leaf-cutting ants, the chemistry of queen's pheromones are unknown as well and their role in communication inside the colony. This study represents the first attempt to elucidate the cuticular hydrocarbons of queens and males from the ant *Atta sexdens*. Extracts were prepared from young queens (n=37) and males (n=14), collected in the field during mating flight, and from established queens (n=12) collected from nests reared in the laboratory. Cuticular extracts were analyzed through GC-MS. A total of 46 compounds were present in the cuticle of males and queens. The cuticle of queens and males contains a greater diversity of branched alkanes and a smaller variety of linear alkanes. The exclusive presence of the dodecanoic acid octadecyl ester and tetradecanoic acid eicosyl ester in the cuticle of older queens suggests a relation with fertility status. The exclusive presence of the *n*-C₃₅ and 7,11,15-TriMeC₃₅ in the cuticle of males could be related to mate recognition. Further research will be needed to evaluate the behavioral or physiological responses of males and workers ants to queen pheromone components (UENF, FAPERJ, CAPES).

3.4.10 INFLUENCE OF TEMPERATURE ON ANT MORPHOLOGY IN PANTANAL AND AMAZON BIOMES

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Ants (Hymenoptera, Formicidae) are present all over the globe, with the exception of the poles. Pantanal and Amazon are two of the six Brazilian biomes. Pantanal is marked by two well-defined seasons, one dry and one with rain and flooding. The Amazon biome is marked mainly by constant temperatures and rainfall. Thus, we have two situations with different sets of ecological conditions and resources for the different organisms in these places. Our aim was to understand if these different conditions results in morphological changes in ants that allow the same species to be present in both biomes. For this, we sampled 60 ants (ten individuals of *Camponotus* sp. 7, nine of *Crematogaster torosa*, eight of *Ectatomma edentatum*, seven *Labidus coecus*, six of *Nylanderia* sp. 3, nine of *Nylanderia* sp. 4 and 11 ants of *Wasmannia auropunctata*) and measured environmental variables (temperature, precipitation and canopy cover) in the two biomes. We took photos of the individuals and measured their morphological characteristics (e.g. mesosome, femur and tibia length, head height and width, distance between the eyes and the X and Y axis of the eye) to compare these characteristics between the same species present in the two biomes. Then, we checked if the environmental variables have any influence on them. We found differences between the environmental variables and the measurements of the ants between the two biomes. Furthermore, we observed a positive influence of temperature on the measure of femur and tibia length, head width and X and Y axis of the eye, just on *Crematogaster torosa*. In ants, these characteristics are related with the locomotion, mandibular muscles and food search, respectively. We believe that the optimal level of assimilation of some resource may be closer to higher temperatures causing greater allometry. Understanding the existence of this pattern and to what extent it occurs can help to explain their distribution along temperature gradients, and their thermal adaptation to the availability of resources. (UFLA, CNPq, PIBIC/UFLA, CEMIG, RUFFORD)

3.4.11 DIFFERENCES IN SEROTONIN CONTENT IN LEAF-CUTTING ANT BRAINS PROVIDES SUBSTRATES UNDERLYING TASK ALLOCATION AMONG WORKERS

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In ants, alloethism is the behavioural strategy characterised by the distribution of activities (division of labour) based on morphological differences of workers. In such cases, brains of workers must have neural substrates to support differences in behaviour. However, the neural basis underlying alloethism is still unknown. One powerful candidate to regulate such differences is the biogenic amine serotonin, which acts as neurotransmitter, neurohormone, and neuromodulator from insects to mammals. Here, we aimed to quantify and compare, across different-sized workers, immunostaining intensity against serotonin as a standard to semi-quantify the amount of serotonin within neurons and brain compartments where they project their axons to. We developed a reliable protocol based on immunocytochemistry procedures, three-dimension image analysis obtained from confocal microscopy, and data analysis that allowed us to assess these differences in the brains of worker caste of the leaf-cutting ant *Atta vollenweideri*, a species in which workers may present up to 200 fold differences in body mass. We found no significant differences between body size and serotonin levels in the mushroom body and antennal lobe compartments of *A. vollenweideri*. However, we found significant differences in immunostaining against serotonin in the optical lobe (OL) and central complex (CC) compartments. In the OL, such differences were characterised by an increase in serotonin level in workers with intermediate body size (median and major workers). In CC compartments, a negative relationship was found, likely due to difficulty of antibodies to reach inner regions of the brain, and the CC is the innermost brain compartment of *A. vollenweideri*. Intermediate workers also presented a greater variability in the number of serotonergic neurons in the optic lobe cluster as well as higher levels of serotonin in the somata of this cluster were found. According to the traditional literature, median workers show broader behavioural repertoires, performing tasks both inside and outside the nest, whilst major workers are traditionally considered as “foragers”. Both groups may rely on visual cues while searching for food or returning home. Thus, the differences obtained from our protocol reflect behavioural specialisation of workers. (USP, UK, CsF, CNPq, FAPESP)

3.4.12 THE RELATIONSHIP BETWEEN EVOLUTION OF SETAE AND THERMAL TOLERANCE IN THE TURTLE ANTS (*CEPHALOTES*)

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The formation of the seasonally dry cerrado in Brazil has presented ecological opportunity to species previously adapted to wet forest, but species transitioning to this biome experience increased exposure to insolation and greater heat stress. This biome also includes high heterogeneity in thermal microhabitat, ranging from canopy-covered gallery forest to exposed grassland. Species of the ant genus *Cephalotes* are found throughout the Neotropics and reach high species richness in cerrado. Additionally, these ants exhibit high morphological diversity in setae covering the cuticle, which are often scale-like and highly reflective. Here, we investigate the role of thermal environment and sun exposure in shaping the evolution of this highly variable trait. The functional capacity of setae to deflect heat was determined for four co-occurring species by measuring internal body temperature of focal species with natural setae cover and with setae removed by forceps before and after exposure to a halogen lamp. Thermal environment of trees inhabited by each focal species was characterized by measuring tree surface temperature each 0.5 m along branches in the foraging range of a colony. For a broader phylogenetic sample of species, percent cuticle coverage on the dorsal surface of each major body segment was determined using carefully oriented images and the ImageJ particle analysis function. These measurements were analyzed across the genus *Cephalotes* with phylogenetic comparative tools, comparing setae cover evolution of species in dry or seasonally dry biomes to those in wet forest. Setae removal experiments indicate that setae provide a buffering of internal body temperature against increased sun exposure. Phylogenetic comparative analyses across the genus suggest a high lability of setae cover within *Cephalotes* species distributed throughout cerrado. These results suggest a link between the evolution of setae cover, thermal buffering of internal body temperature, and thermal microhabitat of preferred nesting locations in *Cephalotes* species. This ongoing research will contribute to understanding the role of shifts in abiotic conditions, often associated with major biome transitions, in the evolution of adaptive thermal traits. (GWU)

3.5 GENETICS, EVOLUTION, PHYLOGENY, TAXONOMY, SYSTEMATICS, PHYLOGEOGRAPHY AND BIOGEOGRAPHY

3.5.1 A TAXONOMIC STUDY OF THE BRAZILIAN TURTLE-ANTS (FORMICIDAE: MYRMICINAE: *CEPHALOTES*).

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The ant genus *Cephalotes*, whose members are known as turtle-ants, is uniquely found in the New World. All *Cephalotes* species are exclusively arboreal, nesting in galleries in wood perforated and abandoned by other insects. Almost all species are polymorphic, with major workers that are responsible for protecting the nest entrance using their heads. The last taxonomic revision on the genus was published by De Andrade & Baroni-Urbani (1999) who synonymized three genera under *Cephalotes* and recognized 118 species divided into 24 species-groups. That study also provided a morphological phylogeny, images and a key for the identification of all species. According to the same work, 60 species are known so far to Brazil, divided into 15 species groups. Since then, a single species was described, *C. specularis* Brandão, Feitosa, Powell & Del-Claro, 2014. The last comprehensive phylogeny of the genus, using molecular data, showed that some of De Andrade & Baroni-Urbani's groups are evolutionary artificial. The recent phylogenetic evidence, the accumulation of specimens in scientific collections, and the difficulty to apply names for some specimens based on the current key make it clear that a new taxonomic study on the genus is necessary to update the knowledge about *Cephalotes* internal classification. So, in this study we propose a re-examination of the Brazilian species based on morphological and phylogenetic data. We intend to provide updated descriptions, high-resolution images, distribution maps for the new species, and identification keys for the species-groups and for all the species in each group known to occur in Brazil. So far, after the examination of more than 3.000 specimens of all species known from Brazil, deposited in six representative institutions, we were able to recognize at least three new species for the *atratus*, *fiebrigi*, and *pinelii* species-groups. In addition, two species and two groups will be synonymized. Identification keys are being prepared, as are the descriptions, images, and distribution maps for the new species. (UFPR, CNPq)

3.5.2 A COMPARATIVE MORPHOLOGICAL STUDY OF *STRUMIGENYS* F. SMITH, 1860 (HYMENOPTERA: MYRMICINAE: ATTINI) AND RELATED GENERA

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The myrmicine genus *Strumigenys* is one of the largest among ants and it has outstanding morphological variation. Although most species are peculiar and readily recognizable, the many "exceptional" species makes it a hard genus to be morphologically defined, so that studies have failed to demonstrate universal synapomorphies. We performed a comparative morphological study between *Strumigenys* and related myrmicine genera in search of synapomorphies for *Strumigenys*, focusing on the closely related basicerotines and phalacromyrmecines. We assumed the relationships recently inferred in molecular-based phylogenetical studies in which basicerotines (*Basiceros*, *Rhopalothrix*, *Eurhopalothrix*, *Octostruma*, *Talaridris* and *Protalaridris*) and phalacromyrmecines (*Phalacromyrmex*, *Pilotrochus*, and *Ishakidris*) are closely related to *Strumigenys* (these lineages termed SPB-clade hereafter). We studied 1130 specimens of *Strumigenys*, 25 of which were disarticulated specimens of various groups of species. The specimens were sorted in 128 species/morphospecies (28 of which were male-based). We studied through disarticulated specimens other 35 genera, including all basicerotine genera, many other Attini, and a few Solenopsidini, Crematogastrini, Stenammini, and Pogonomyrmecini. Five characters have been detected as very important to diagnose *Strumigenys*, but not exclusive. They are: *A*, dorsally oriented metapleural seta originating posterior to the metacoxal foramen; *B*, a notched ventral margin of the posterior mesosomal foramen; *C*, an anterior carina on postero-sternite II, forming a "translucent patch" on ventral petiole; *D*, tergosternal fusion on abdominal segment III; and *E*, exocrine glands on legs externally seen as pale patches. *A* is found in most basicerotines and phalacromyrmecines, but are never hypertrophied in basicerotines as it is in *Strumigenys* and in the phalacromyrmecines. *B* is only shared with phalacromyrmecines (*Phalacromyrmex* checked). *C* is only shared with the phalacromyrmecines (*Phalacromyrmex* and *Ishakidris* checked). *D*, either partial or complete fusion, is observed in most basicerotines and is unknown for the phalacromyrmecines. *E* is putatively present in phalacromyrmecines, but if so, then never as a distinctly marked patch as seen in *Strumigenys*. Males of *Strumigenys* always manifest *B*, *C* and *D*, sometimes manifest *E*, and hardly ever *A*. A single composite character is exclusive of *Strumigenys*, namely the cuticular spongiform outgrowths of abdominal segments II to IV *plus* the "spongiform pad" on postero-sternite IV, here found to be composed of highly specialized setae instead of cuticular outgrowths. Our findings better characterize the SPB-clade by reinterpreting previously studied characters and describing new ones. They further clarify the sister relationship of *Strumigenys* and the phalacromyrmecines and strongly define the limits of *Strumigenys* itself. (CNPQ, CAPES)

**3.5.3 TAXONOMY AND BIOGEOGRAPHY OF THE ANT
GENUS *GNAMPTOGENYS* (*STRIATULA* GROUP)
(HYMENOPTERA, FORMICIDAE, ECTATOMMINAE)**

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Gnamptogenys Roger, 1863 is a diverse genus of Ectatomminae, widely distributed across the Neotropics, Southeast Asia and Australia. Currently, the genus comprises almost 140 species worldwide. In 1995 and 2004 were provided revisions for both the Neotropical and Asian species of the genus based on morphological data, proposing six species groups for the neotropics, including the *striatula* group, and five species groups for Asia. In the 2004 revision it was also suggested a close relationship between the Australasian *Gnamptogenys* species (*albiclava* and *epinotalis* groups) and the *striatula* group. Confirming Lattke's thoughts, recent phylogenies recovered a clade comprising these groups, suggesting a very interesting biogeographic history for this lineage. The *striatula* group is the richest Neotropical group of *Gnamptogenys* with 25 species. The group particularly shows a high morphological intraspecific variation that leads to ambiguous species boundaries. The geographical distribution of the species also reveals an unusual and unexplored biogeographic history. In this context, the aim of this study is to provide a comprehensive taxonomic revision of the *striatula* group of *Gnamptogenys* including all Neotropical species and the Australasian groups *albiclava* and *epinotalis*. We also intend to evaluate the biogeographic history and the relationship between the groups. A detailed morphological description for each taxon, including the putative new species will be offered, as well as high-resolution image plates, schematic illustrations and morphometric measurements for all the castes obtained from Neotropical and Australasian species. The biogeographic analysis will be assessed based on the DEC model. Morphological information for all Neotropical species of the *striatula* group was already gathered, leading to the recognition of four new species. The next steps include the morphological phylogeny and the biogeographic analysis. Considering this, the present study intends to offer solid species delimitations within the *striatula* group and contribute to the increase of the knowledge about the taxonomy, evolutionary history and the biogeographic relationships of *Gnamptogenys* and Ectatomminae as a whole. (CNPq, USAID/NAS)

3.5.4 USING MOLECULAR TOOLS TO INVESTIGATE EDGE EFFECTS ON GENETIC DIVERSITY OF *ODONTOMACHUS CHELIFER* (FORMICIDAE: PONERINAE) IN A CERRADO RESERVE

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Habitat fragmentation may lead to changes in community composition, population distribution, species interactions, and intraspecific genetic diversity. Therefore, ants can be especially susceptible to environmental constraints resulting from fragmentation, since haplodiploid sex determination contributes to a naturally low genetic variation in this group. *Odontomachus chelifer* is a facultatively polygynous and poneromorph ant species that participates in many interspecific interactions in the Brazilian cerrado savanna, including predation on ground-dwelling arthropods and dispersal of fallen fleshy seeds and fruits. These ants are vulnerable to border effects resulting from anthropogenic disturbance, which may decrease nest survival. In ants, colony genetic diversity is directly influenced by polygyny, which in turn responds to environmental constraints, including limitations of food and nesting resources, or physical disturbances. Thus, it is important to understand the potential effects of habitat fragmentation on polygyny and colony genetic structure of *O. chelifer* in order to conserve their populations and ecological role. In this study, we investigate genetic diversity and functional polygyny in *O. chelifer* colonies, and their possible association to edge effects in cerrado by using microsatellite markers. Six workers from the same *O. chelifer* colony were used to develop a microsatellite-enriched library, which consists in the use of (CT)₈ and (GT)₈ biotin-linked probes and subsequent recovery by streptavidin magnetic-coated beads. Thirty workers from different nests collected in a cerrado reserve in Mogi-Guaçu-SP (southeast Brazil) were used to characterize the developed microsatellite loci. Polymorphic markers will be genotyped in workers from 12 nests from the same cerrado reserve (6 located at edge, and 6 in the interior of a fragment). Forty-two microsatellite loci were developed, from each 31 successfully amplified by polymerase chain reaction (PCR), with 12 loci showing evidence of polymorphism. For genotyping, 24 best amplified loci were characterized by its polymorphism content. Workers from edge and interior nests are being genotyped. Genetic analyses will include estimates of allelic richness, expected and observed heterozygosity, and effective size, as well as kinship reconstructions to infer polygyny in *O. chelifer* colonies. Our work provides molecular tools to investigate factors that shape the genetic response of ant colonies to fragmentation, including polygyny and genetic variation within them, opening new avenues for future studies. (CAPES, CNPq, FAPESP, CONICET)

3.5.5 ENVIRONMENTAL RESISTANCE EVOLUTION IN ANTS (HYMENOPTERA: FORMICIDAE): EFFECTS OF BODY SIZE, CUTICULAR BRIGHTNESS AND NESTING LAYER

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Environmental resistance research have deep implications to understand life distribution on Earth, as well as to manage conservation strategies. When an evolutionary approach is applied, we add a historical component that allow us to try to infer past and future distribution of living organisms. Environmental resistance is achieved by integrating morphological, behavioral and physiological mechanisms. To advance our understanding of the evolution of environmental resistance in ants, we investigate the relationship between thermal and desiccation resistance in relation to body size, nesting preference and cuticular brightness of Atlantic Rainforest and Cerrado ant species from South Brazil, under a phylogenetic approach. We hypothesize a positive relationship between environmental resistance and ant body size, a negative link to cuticular brightness, and higher resistance in arboreal than twig and ground nesting ants. We collected data of low and high thermal extremes and desiccation resistance of 58 ant species, distributed in four different forest areas, including both Atlantic Rainforest and Cerrado biomes. A maximum likelihood phylogeny of those 58 ant species was inferred, based on one nuclear and one mitochondrial locus. Phylogenetic Generalized Least Squares (PGLS) models were constructed to test our hypotheses, and Akaike Information Criterion was considered for model selection. Body size correlates positively with all environmental resistance aspects tested, as expected by simple surface/volume relationships, but reinforcing the contribution of this trait on different facets of animal physiology. Brighter ants were more cold tolerant, contrary to our initial hypotheses, but cuticular brightness showed a negative correlation with desiccation and upper thermal resistance. In general, cuticular brightness estimates were extremely low, leading us to question the biological relevance of this variable in our environmental resistance context. Finally, nesting preference remained in just one PGLS model, suggesting the evolution of this behavioral characteristic is not related to environmental resistance requirements of those ant species. If body size effects on ant environmental resistance behave as expected, the low influence of cuticular brightness and the phylogenetic restriction of nesting preference were surprising, as those traits were described on another studies as important aspects of thermal and desiccation balance of insects in general. Other traits need to be investigated to develop a better understanding of ants environmental resistance evolution, like the role of heat shock proteins and cuticular insulation. (Programa de Pós Graduação em Ecologia e Conservação, UFPR, CAPES)

3.5.6 REVEALING THE PHYLOGENETIC AND PHYLOGEOGRAPHIC HISTORY OF THE LEAF-CUTTING ANT GENUS *ATTA* FABRICIUS, 1804 (FORMICIDAE: ATTINI) USING ULTRA-CONSERVED ELEMENTS (UCEs).

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The leaf-cutting ant genus *Atta* Fabricius is morphologically and behaviorally highly specialized group of fungus-growing ants. *Atta* species have a wide geographical distribution in the Americas, are considered dominant herbivores in the Neotropical region, and are of economic importance as agricultural pests. Taxonomic delimitation of the *Atta* species is difficult, especially when utilizing exclusively morphological characters and smaller workers. In 2009, multi-locus molecular phylogenetic studies conducted by Bacci and colleagues provided evidence for species delimitation between *Atta* species and clarified the phylogenetic relationships between some species groups in the genus. However, this first phylogenetic delimitation did not include a complete taxon sampling and did not cover the extensive geographic distribution of *Atta* species. Currently, we are inferring a new and more robust molecular phylogeny of *Atta*, using genomic markers, i.e., Ultra-Conserved Elements (UCEs). In addition, we sampled populations of all species across their geographic distribution ranges. To accomplish a comprehensive taxon sampling, we used samples collected by colleagues and deposited in major entomological collections. We complemented the sampling by conducting field expeditions specifically targeting rarely collected species. We gathered at total of 792 samples from 20 countries, and within Brazil, we have sample 25 States. Our preliminary analysis consists of molecular data obtained from 272 samples corresponding to 14 of the currently recognized 15 extant *Atta* species, excluding two unidentifiable taxa and one ichnotaxon. Our molecular dataset includes more than 2000 UCE loci per taxon. With this robust dataset, we are: (i) reconstructing the evolutionary history of the leaf-cutting ant genus *Atta*, (ii) inferring the evolutionary relationships among the extant species of *Atta* and other higher attines, (iii) delimiting the species of *Atta*, and (iv) characterizing the biogeography and phylogeography of the species in the genus. Our molecular phylogeny contributes to identifying morphological characters indicative of species boundaries, which will be become important for conducting a next taxonomic revision, highly needed, of the genus *Atta* (ASU, CAPES, FAPESP, NSF, UNESP).

3.5.7 TAXONOMIC REVISION OF THE GENUS *PRIONOPELTA* MAYR, 1866 (FORMICIDAE: AMBLYOPONINAE) FOR THE NEOTROPICAL REGION

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The genus *Prionopelta* Mayr, 1866 (Formicidae: Amblyoponinae) is a tropicopolitan group of cryptobiotic ants mainly known for their conservative morphology. This feature has led to historic inconveniences in the establishment of species boundaries and a lack of taxonomic studies, particularly in the Neotropical region. In fact, the only tool for the identification of the Neotropical species in the genus is an outdated key published in 1960. Here, we present a comprehensive taxonomic revision for the genus based on examination of external morphology of specimens within this geographical range. We provide descriptions and redescrptions for all known castes, comments on taxonomy and biology, illustrated identification keys for females and males, high-quality images and distribution maps for the recognized species. In the revised concept, *Prionopelta* comprises eight species in the Neotropical region, including the already known *P. amabilis* Borgmeier 1949, *P. antillana* Forel, 1909, *P. marthae* Forel, 1909, *P. modesta* Forel, 1909 and *P. punctulata* Mayr, 1866 and three new species. The new species delimitation proposal presented here is the first comprehensive attempt to respond old questions regarding the identity of the Neotropical species of the genus. (UFPR, CNPq, NAS/USAID)

3.5.8 ANTS FROM THE ALTO TIETÊ (SP): CURRENT STATUS OF THE COLLECTION

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Alto Tietê is a region located in the catchment area of Alto Tietê with 20.02% of its vegetation cover consisting of conservation units and forest fragments that belong to the dam areas and private properties. In this case, with different soil uses, such as agriculture, leisure and companies from various economic sectors. All these areas are remnants of the Atlantic Forest, which shelter high biodiversity. Furthermore, Alto Tietê is part of the Metropolitan Region of the city of São Paulo, where urbanization is growing fast. Despite this richness, research on fauna and flora does not cover all remnants of Atlantic Forest, except for ants. The specimens of ants collected are in a collection of reference, which has a fundamental role for the knowledge and conservation of biodiversity. This work updates the database of Alto Tietê reference collection "Silvia Sayuri Suguituru". The collection has dry preserved specimens, with 2,893 occurrence records distributed in ten subfamilies, 63 genera, 158 species and 98 morphospecies. The species identified represent 17% of the total occurring in the Brazilian Atlantic Forest. The genera *Pheidole*, *Solenopsis*, *Hypoponera* and *Brachymyrmex*; the species *Pheidole sospes*, *Solenopsis saevissima* and *Gnamptogenys striatula* and the morphospecies *Solenopsis* sp.2, *Solenopsis* sp.3, *Nylanderia* sp.1 and *Hypoponera* sp.4 are the most frequent. In the collection, there are eight *Myrmelachista* species consisting of an important taxonomic collection for studies on this ant species, which is exclusively Neotropical; and also, species not yet described, such as those in the genus *Megalomyrmex*. The collection also has species with little known biology (*Azteca aesopus*, *Discothyrea neotropica*, *Strumigenys appretiata*, *Strumigenys reticeps*, *Strumigenys tanymastax* and *Typhlomyrmex major*) and threatened with extinction (*Brachymyrmex micromegas*). Most of the records belong to fragments of Dense Ombrophilous Forest, but there are data for urban and agricultural areas. The most used technique is the Winkler extractor, followed by pitfall, manual collection, Berlese funnel and attractive baits. The Alto Tietê reference collection "Silvia Sayuri Suguituru" has extensive inventories that promote the ex situ conservation of ants species from the Atlantic Forest of Alto Tietê. However, efforts are still needed since 40% of the ants are found in morphospecies (UMC, FAEP, FAPESP).

3.5.9 DOES A SEED HARVESTING DIET, HOST PHYLOGENY AND GEOGRAPHICAL LOCATION INFLUENCE THE BACTERIAL COMMUNITY OF *PHEIDOLE* ANTS?

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Recognized as an important driver of evolution, symbiotic relationships are a common phenomenon across the tree of life. The study of such association can help us understand host diversification as well as identify the environmental factors that could be influencing host biology. Special attention is being given to ants since it has been shown that some groups depend on a number of bacterial symbionts playing important functions such as food processing and nitrogen enrichment. For example, herbivorous ants have been shown to have associations with symbionts providing essential nutrients for their survival. However, bacterial symbiont in some ant groups such as seed harvesters have not been studied in detail. This is the first study to evaluate if there are any microbiota signatures related to granivory helping ants to leverage this novel food resource. For this purpose, we focussed on *Pheidole* ants, a highly diverse group with an important role in harvesting seed, a behaviour that is believed to be a possible key innovation leading to the success and diversification of this worldwide distributed group. By using Next Generation Sequencing and analysis with advanced computational techniques we were able to recover the bacterial community associated with over 100 species of the genus *Pheidole* from a worldwide collection encompassing seed harvester and no seed harvester ants and explored the influences of food preference in shaping the bacterial community. We also tested the influences of host phylogeny and geographic location in shaping their microbial community. We found a relatively stable microbiota across species, but we demonstrate that geographical location and food resource may influence the bacterial community of *Pheidole* ants. Despite some ant groups have been shown congruency of bacterial community and host phylogeny this seems not to be the case in *Pheidole* ants since we did not find correlation between host phylogeny and the microbiota accessed in this study highlighting that each group has its own evolutionary story and forces shaping its bacterial community. Our finding suggests that specialized bacteria are likely not required in the evolution of novel food sources in *Pheidole* ants however the recovered bacteria still could play a role in seed harvesting. (Fulbright, National Science Foundation NSF DEB-1900357)

3.5.10 OCCURRENCE OF *NEOPONERA* EMERY, 1901 (FORMICIDAE: PONERINE) IN THE FUNCTION OF THE VEGETATIONAL TYPE AT THE ATLANTIC FOREST BIOME, IN BRAZIL

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The *Neoponera* genus comprises 57 species in the Neotropical Region, of which at least 36 are present in Brazil, found preferentially in humid forests, but also can inhabit dry forests with seasonal rains. Considered a global Hotspot for conservation, the Atlantic Forest biome, in Brazil, is composed of two main forest formations, Ombrophilous Forest and Seasonal Forest. The present landscape constitutes a mosaic of forest fragments, the result of the significant reduction of original cover. Our aim was to analyze the current diversity for the *Neoponera* genus in the Brazilian Atlantic Forest, associating the presence of the species with the vegetation types of the biome. We compiled data from the Mirmecology lab of the Cocoa Research Center, ANTWEB and ANTMAPS data networks and literature. We found information on 27 species of *Neoponera* distributed in areas of Atlantic Forest in 12 Brazilian states. We evaluated the similarity between species, considering presence / absence, using the Jaccard index; and the association / distinction relation of the species with the vegetation types using a multidimensional non-metric ordering. The species recorded in a greater number of vegetation types was *Neoponera apicalis*. In the Atlantic Forest, we recorded *Neoponera goeldii*, a common species in forests of the Amazon region, exclusively in the State of Bahia. The occurrence of species typical of the Amazon region in the Atlantic Forest of southern Bahia probably indicates that these biomes underwent expansion and retraction processes especially due to Quaternary climate fluctuations. The species *N. goeldii*, *Neoponera laevigata*, *Neoponera schultzi* and *Neoponera venusta* follow the same pattern of geographical distribution, occupying exclusively areas of Dense Ombrophylous Forest. The same occurs with *Neoponera agilis* and *Neoponera billema*, in Seasonal areas of Semideciduous Forest. *N. billema*, *N. schultzi*, *N. venusta*, *Neoponera concava* and *Neoponera latinoda*, are endemic from Brazil. *Neoponera schultzi*, in particular, is endemic to the Central Atlantic Forest Corridor, occurring in the states of Bahia and Espírito Santo. We found that the occurrence of the *Neoponera* genus in the Brazilian Atlantic Forest seems to be related mainly to the types of vegetation characteristic of dense forests, where the greatest species richness was found. While a lower species richness was observed in vegetational types of open areas. (PPGECB/UESC, FAPESB, CAPES, CNPq, CEPEC/CEPLAC).

3.5.11 OCCURRENCE OF *DISCOTHYREA SEXARTICULATA* BORGMEIER, 1954 (FORMICIDAE: PROCERATIINAE) IN DIFFERENT LANDSCAPES

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Discothyrea sexarticulata is an ant native to Atlantic Forest, where it nests in the litter of preserved areas. Knowledge about the biology of the species is scarce, but we know that it is a predatory specialist ant, which feeds almost exclusively on arthropod eggs, especially those of centipedes and spiders. A common behavior for the genus is stocking arachnid eggs, where the colony is kept inside the oothecas. The species has a cryptic habit, populations are small and hardly captured at high numbers by traditional collection techniques. Considering that the Atlantic Forest is a mosaic of landscapes of preserved and anthropized areas and that the biology of *D. sexarticulata* is poorly known, we characterized the species occurrence sites in Atlantic Forest fragments located in São Paulo State. We selected six fragments with species occurrence in São Paulo State, in the counties of Mogi das Cruzes, Biritiba Mirim and Salesópolis. In these fragments, we quantified the percentage of native, rural and urban vegetation areas. The mapping was performed at a scale of 1:3000, using a *buffer* of 1 km from the place where the species was found. Our results indicate that *D. sexarticulata* occurs in areas that have 27 to 91% of native vegetation, 2 to 42% of rural area, and 0 to 70% of urban area in its adjacencies. Large landscape variation around the forest fragment does not influence species occurrence, since it was captured in very anthropized sites and in those preserved areas. Thus, our results suggest that the vegetation and the quality of litter that is close to the nest are more important than the landscape as a whole (Kimberly-Clark, CNPq).

3.5.12 COULD ANTHROPIC ACTION INFLUENCE THE HAPLOTYPE DIVERSITY OF FIRE-ANTS IN URBAN PARKS?

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Ants of the genus *Solenopsis* are popularly known as fire-ants. They are a very diverse group taxonomically currently composed of 196 species. Because they are considered generalists by their food habit and very aggressive with other species, they can modify the fauna of arthropods of the place where they establish their nests. In some regions of the United States, the species *Solenopsis invicta* considered an invasive ant causes serious damage to the community of native species and public health problems due to accidents caused in humans. Numerous studies showed about the diversity of these ants in many different environments, whether in agricultural environments, native forests or in urban areas. In studies with other urban species has been demonstrated that anthropic action can influence the composition of the fauna, whether diversity, dispersion, and ecological interactions. The aim of the study were: i) to identify species of the genus *Solenopsis* associated with urban parks in Guarulhos, SP (Brazil); ii) to know the haplotype diversity of these fire-ants species; iii) to verify the correlation between geographic distance and genetic distance of the species. Samples were collected in urban parks of Guarulhos-SP (Brazil), with a total of 34 squares with a representative of all the districts of the city. The ants were collected and stored in 90% ethanol. The genomic DNA was extracted with the Qiagen kit following the manufacturer's recommendations. The identification was used cytochrome oxidase I region (COI), which were amplified fragments of 450 bp and sequenced by the Sanger method. Sequences were edited with the BioEdit software aligned by ClustalW and compared to sequences deposited in GenBank using Blast-n. The haplotype diversity was calculated by the software DnaSP v5, the haplotype network assembled by the Network and the phylogenetic tree (Maximum Likelihood) by MEGA 5.2. To analyse the correlation between genetic and geographic distances, the Mantel test in R software were performed. Two species were found: *Solenopsis saevissima* and *Solenopsis invicta*. The haplotype diversity recovered six haplotypes for *S. saevissima* and four *S. invicta*. In addition, there was no correlation between genetic and geographic distance, indicating that there is influence of anthropic action by shuffling the fire-ants haplotypes in urban parks. (CNPq)

3.5.13 A MALE-BASED CHARACTERIZATION OF SPECIES GROUPS OF NEOTROPICAL *GNAMPTOGENYS*

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Males have been historically neglected in myrmecological taxonomic works, with only around 27% of all ant species having both female and male described. The ectatommine genus *Gnamptogenys* occurs in the Neotropic, Indomalayan and parts of the Nearctic and Australasia regions. Globally, the genus has 139 extant species. The New World species are divided into 6 groups (based on female characters), and only 4 species of males are associated to the females. In this work we aimed: (i) to characterize the general male traits for each species group of Neotropical *Gnamptogenys*, (ii) to start a process of accumulation of male “official morphospecies” for the genus, (iii) to establish key characters helping to differentiate the morphospecies. The examined material is deposited in the myrmecological collection of the Universidade Federal de Viçosa. Most alates were sampled in a large study that used 18 Malaise traps during 5 months (December 2016 to May 2017). Whenever possible, males were disarticulated to allow the study of mouthparts and genitalia. In total we had 42 species and morphospecies of *Gnamptogenys*, 28 of which represented by females only, 7 represented by males only, and 7 with associated male and female. Among the species represented by males, 4 were considered as “probably belonging to a female species or morphospecies” and 3 of them could not be inferred to belong to any female morphospecies, including an aberrant one which could not even be associated with any species group (*Gnamptogenys* ufV-01). The female species studied were assigned to 9 species groups, and the male morphospecies to 6: *sulcata* (2 spp.), *rastrata* (4 spp.), *striatula* (3 spp.), *mordax* (2 spp.) and *minuta* (1 sp.). Characters useful to separate the species groups were: palpal formula, masticatory margin of mandible and head sculpturing. Characters useful to separate the morphospecies were: ocular index, propodeal spiracle position, propodeal surface, development and shape of petiole sternite process. We expect males will gradually be associated to named species of *Gnamptogenys* if this system of “official morphospecies” is followed and augmented by other authors. The accumulation of information about the male morphospecies will gradually restrict the number of possible female forms each of them correct matches. Moreover, fortuitous nest sampling records will benefit from the information accumulated by this system of “parallel taxonomy”. We hope this study serve as an model for further investigation on males in other ant lineages.

3.5.14 IDENTIFICATION OF *SOLENOPSIS* SPECIES USING MORPHOLOGICAL TRAITS

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Species of the *Solenopsis saevissima* complex, known as fire ants, cause problems to agriculture, biodiversity, and public health due to competition, aggressiveness, and transport of pathogens. Group identification is complex due to similarity of morphological traits and the presence of interspecific polymorphism, making it difficult to characterize hybrids. By using the molecular marker Cytochrome Oxidase I in previous studies with specimens from the Alto Tietê Cabeceiras region, species *S. invicta*, *S. saevissima*, and *S. macdonaghi* were identified, the latter being an unpublished record for São Paulo state. Thus, aiming to corroborate molecular identification, this study comprises 22 morphological traits of specimens from the same nests. Moreover, we performed the same morphological analysis on *S. macdonaghi* specimens collected in Asunción and Carmen del Parana (Paraguay), which are the regions of origin of the species. We analyzed a total of 365 workers, of which 115 belonged to species *S. invicta*, 115 to species *S. saevissima*, and 135 to species *S. macdonaghi*. Among the 22 traits studied, mandible gape width, clypeus length, eyes length, petiole width, postpetiole width, and petiole height were shown to be statistically different among species, especially when compared to *S. macdonaghi*. Our results show that the specimens identified by Cytochrome Oxidase I as *S. macdonaghi* are distinct from *S. saevissima*, but similar to *S. invicta*. The comparison between *S. macdonaghi* specimens collected by us and those collected in Paraguay showed that only postpetiole length does not differ among workers. Results also show that species *S. macdonaghi*, identified using a molecular tool, may be a hybrid between *S. invicta* and *S. saevissima*, suggesting a possible error of identification of the species in the GenBank molecular database (FAPESP, CNPQ).

3.5.15 GENETIC DIVERSITY AND STRUCTURE OF TWO SPECIES OF ECOLOGICALLY CONTRASTING CARPENTER ANTS REVEALED BY MICROSSATELLITES AND SNPs: A COMPARATIVE APPROACH

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Molecular markers are important tools used in a wide range of genetical, ecological and evolutionary studies. They allow one to estimate migration, delimit species and infer kinship degrees. These applications are directly related to the different types of markers and their particularities. Currently we can highlight the use of two markers: Microsatellites and single nucleotide polymorphism (SNPs). Although there is a growing interest in comparing these methods, such studies are usually associated with model organisms. Among non-model organisms, ants stand out because they present important ecological interactions and a wide geographic distribution. Because there are no comparative studies of both markers with ants, to our best knowledge, here we aim to compare genetic diversity and population structure based on microsatellites and in SNPs for two ecologically distinct species of carpenter ants, *Camponotus rufipes* and *C. renggeri*. To measure genetic diversity, we used metrics such as the observed (H_O) and expected (H_E) heterozygosities and the fixation index for each species. Genetic structuring was measured by approaches such as Principal Component Analysis (PCA), Discriminant Analysis of Principal Component (DAPC), and Spatial PCA (sPCA). Our preliminary genetic diversity results for both species revealed significantly lower values inferred by SNP markers when calculated the metrics (H_O), (H_E) and fixation index than the values obtained by the microsatellites for each species. For genetic structuring the results of DAPC, PCA indicated that *C. renggeri* is not substantially structured whereas *C. rufipes* individuals are clearly clustered in two groups. Considering the geographical space, sPCA results revealed by SNPs and microsatellites indicated only global structuring patterns present in both species. Our preliminary results suggest that genetic structure and diversity differences are outcomes of distinct features of each marker and, therefore, these methods can be used in a complementary way. (CNPq-PIBIC/UNESP, FAPESP 2017/18291-2, 2018/21548-8).

3.5.16 LARGE ANTS ARE NOT EASY, THE TAXONOMY OF *DINOPONERA* ROGER

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The genus *Dinoponera* Roger, 1861 (Hymenoptera: Formicidae: Ponerinae) is exclusively South American and stands out for having the largest ant workers in the world, exceeding 3.5 cm of body length. Despite being a relatively well studied group, there is still uncertainty in the species delimitation. The objective of this work was to taxonomically revise the species of *Dinoponera* based on the external morphology of females. More than 1,000 specimens belonging to 19 national and foreign institutions were examined. Specimen external morphology was studied and measured for making descriptions and redescriptions. All species are illustrated with high resolution photographs. Distribution maps were produced using label information from examined specimens. The results indicate there are eight species in the genus, all occurring in Brazil. One species is described for the first time and the others are redescribed. The species *D. grandis* (Guérin-Méneville, 1838) is revived and considered as a senior synonym of *D. australis* Emery, 1901 n. syn. The species *D. snellingi* Lenhart et al. 2013 and the subspecies *D. australis bucki* Borgmeier, 1937 and *D. australis nigricolor* Borgmeier, 1937 are synonymized under *D. grandis*. The species presently in the genus are *D. gigantea* (Perty, 1833), *D. grandis* n. stat., *D. hispida* Lenhart et al., 2013, *D. longipes* Emery, 1901, *D. lucida* Emery, 1901, *D. mutica* Emery, 1901, *D. quadriceps* Kempf, 1971 and *D. n. sp.* The intraspecific variation and natural history of all species is discussed. A new illustrated identification key that accounts for intraspecific variation is provided. (UFPR, CNPq)

3.5.17 A NEW SPECIES OF THE GENUS *THAUMATOMYRMEX* MAYR, 1887 (PONERINAE, PONERINI) ASSOCIATED WITH THE LATE QUATERNARY INLAND DUNE SYSTEM OF THE MIDDLE SÃO FRANCISCO RIVER, NORTHEASTERN BRAZIL

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Thaumatomyrmex is a Neotropical genus with geographic range from South of Brazil to Mexico, occurring in Caribbean islands too. It is represented by 13 valid species, but many others remain to be described. The widely spaced frontal lobes and the very long, slim and curved mandibles with three or four slim and pointed teeth make this taxon unmistakable. Kempf in his revision of the genus in 1975 made three taxonomic groups: *ferox* group, *cochlearis* group and *mutilatus* group. The main objective of this work was to describe a new species of *Thaumatomyrmex* found in the ecoregion of the Caatinga biome “dunes of middle São Francisco river”, in Casa Nova (Bahia, Brazil), and to identify new diagnostic characters for *Thaumatomyrmex* species. Specimens of the new species were found on plant litter by active visual search at night, they were stored in alcohol before to be meticulously dry mounted to allow the access to the greatest number of morphological characters. The collected specimens belong to the same species that was assigned to the *mutilatus* group. They were compared to the described species of this group using the original description and the images of the types, but they were also compared with specimens of other undescribed species of this group. The new species can be easily differentiated from the other ones of the *mutilatus* group by presenting mandibles with only three teeth (four in the others), the second and the third ones extremely short compared to the same in the other species. Other important characters were found to group specimens and species or to better define existing group, such as a denticle at the base of the first tooth, presence of a setae on the side of propodeal spiracle, shape of the base of mandibles and posterior base of the petiole. We also suggest new measurements and indexes, such as the third tooth length and its relationship with head width. This new species will be the first one described from the paleo-dunes of the middle São Francisco river and is probably endemic of this peculiar desertic region of the Caatinga biome. Longino in the last eighties highlighted the complexity of *Thaumatomyrmex* taxonomy and besides the description of a new species this study is a contribution to better understand the variability/stability of characters within and between populations and species and to start the new taxonomic revision of the genus and to make its phylogeny. (UNIVASF, CNPq)

3.5.18 ILLUMINATING THE ANT DIVERSITY IN THE MAIN KNOWLEDGE GAP OF BRAZIL: FIRST SURVEY OF THE ANTS OF PIAUÍ

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The ecosystems of Piauí, a Brazilian Northeast state, have been suffering from anthropic activities since the 1960s, when government tax incentives for agricultural projects have started. Although the well-known importance of the conservation of these areas, the ant fauna in this region of the Neotropics is comparatively unexplored. In fact, Piauí probably has a widely underestimated number of species, being globally indicated as one of the most probable points for the presence of new taxa in ants, especially considering the ecosystems' diversity generated by the transition of three biomes in the State, the Cerrado, Caatinga and the Atlantic Forest. Despite the recent increase in studies of ant diversity in the Neotropical region, Piauí still represents a knowledge gap regarding its ant fauna. Therefore, this study aimed to increase the knowledge of the ant fauna of the state by generating a list of species with data obtained from the literature and collection expeditions to Serra da Capivara National Park and Serra das Confusões National Park. Species occurrences were gathered from a broad survey of literature references and the Ant-maps.org online repository. Ants from the expeditions to the National Parks were processed and identified in the Laboratório de Sistemática e Biologia de Formigas at Universidade Federal do Paraná and deposited in the Padre Jesus Santiago Moure Entomological Collection at UFPR (DZUP). The listed species/subspecies were taxonomically validated by the Ant catalog (Antcat.org). Geographic coordinates not presented in the literature were georeferenced by the Google Earth platform. A total of 149 species in XX genera and XX subfamilies were registered from 23 localities in Piauí. Fifty out the 149 species recorded represent new records for the state, eight are new records for the Brazilian Northeast region, and one consists of a new record for the country. This work represents the first standardized study for the ants fauna of Piauí. The species list presented considerably exceeds the current number of species currently registered for the state. From the current 47 records, the number of species for Piauí raises to 149 with a tendency to increase with the accomplishment of future field endeavors and advances in the study of the local ants. (CNPq, USAID/NAS).

3.5.19 THE USE OF MOLECULAR MARKERS IN THE INVESTIGATION OF POLYDOMY IN A CERRADO SAVANNA ANT, *CAMPONOTUS LEYDIGI* (FORMICIDAE: FORMICINAE)

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The identification of polydomy in ant colonies (i.e. physically separated but socially connected nests) is important to understand ant life history, evolutionary success, and biotic and abiotic impacts on the environment. Polydomous ants are ecologically successful due to diet diversification and increased rate of resource exploitation (through area expansion and/or increased foraging efficiency). Delimitation of polydomous colonies requires the use of several methods, including behavioral, spatial, and genetic approaches. *Camponotus leydigi* (Forel) is a widely distributed ant species in the Neotropics, and is frequently found in the Brazilian Cerrado savanna interacting with plants and other insects. Recent behavioral and spatial data supported the existence of polydomy in *C. leydigi* colonies in the cerrado reserve at Itirapina-SP (southeast Brazil). In the present study, we developed and characterized microsatellite molecular markers to complement our ecological observations suggesting a polydomous habit in *C. leydigi*. Six *C. leydigi* workers from the same colony were used to obtain a microsatellite-enriched library. According to this method, repetitive sequences are captured with (CT)₈ and (GT)₈ biotin-linked probes, with subsequent recovery by streptavidin magnetic-coated beads. Thirteen microsatellite loci were obtained, from each ten successfully amplified after polymerase chain reactions (PCR). Thirty different *C. leydigi* genotypes were used for loci characterization, such as their polymorphism content. Polymorphic microsatellite markers are being selected to analyze the relatedness among workers from ten nests belonging to a single *C. leydigi* polydomous colony. Genotypic data will be analyzed using both frequentist and Bayesian approaches. Our work provides valuable molecular tools that will allow future studies on population genetics and ecology of *Camponotus* ants in Cerrado, including behavioral, dispersal and conservation investigations. (CAPES, CNPq, FAPESP)

3.5.20 ANT SPECIES (HYMENOPTERA: FORMICIDAE) RECOGNIZED FOR THE STATE OF TOCANTINS, BRAZIL

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We currently know approximately 13.500 ant species worldwide, some 3 thousand registered for the Neotropics, and 1.500 for Brazil. Part of the knowledge about this biodiversity is housed in the Formicidae Collection at the *Museu de Zoologia da Universidade de São Paulo/MZSP*, recognized as one of the largest and more representative ant collections in and for the Neotropics. Although Brazil stands out not only for its ant diversity, but also by the number of ongoing and past researches, our knowledge still lacks sistematization. Only the States of Pernambuco, Santa Catarina, Paraná, and Mato Grosso do Sul have published lists of species. In this context, this work aim to systematize the ant fauna registered in the Tocantins State through the study of the material deposited in the MZSP Collection, and the data available in the literature. Of the 139 Tocantins' counties, samplings were carried out in only 26, distributed throughout the State. In total, 131 species, 49 genera and 10 subfamilies were registered. Myrmicinae is the richest subfamily, with 22 genera and 50 species, followed by Formicinae (6 genera/17 species), Pseudomyrmecinae (1/16), Ponerinae (7/14), Ectatomminae (2/14), Dolichoderinae (5/9), Amblyoponinae (2/6), Dorylinae (2/3), Paraponerinae and Agroecomyrmecinae (both with 1/1). The majority of the species data comes from MZSP Collection (99 species). It is noteworthy that the specimens collected by the projects “*Programa de Monitoramento da Ferrovia Norte-Sul*”, “*Avaliações Ecológicas Rápidas do Centro-Leste do Tocantins*”, and “*Avaliações Ecológicas Rápidas do Nordeste-Noroeste do Tocantins*”, which are deposited in the MZSP, are under organization and identification at the moment; this material has not been accounted yet. From the 11 papers available in the literature, we listed 46 nominal species. Of these, 32 are records exclusive from literature, and only 14 are shared with the MZSP Collection material. Furthermore, the analyzed works comprise different areas, as taxonomy (5), ecology (4) and inventory studies (2), being 5 general scientific papers, 3 dissertations and 3 theses. Both taxonomy and inventory studies indicate the depositary institution of the collected material, while those of ecology do not provide this data. This information is important because it makes the material available for new researches, and allows that the identified species to be related to a given museum specimen. In this first and partial analysis, it was also noted the lack of accuracy of the label data; many labels do not inform geographic coordinates, biome or phytophysiognomy sampled, and/or applied collection technique. (FAPESP 2017/07366-1, 2018/11453-0)

3.5.21 CYTOGENETIC STUDY OF *DOLICHODERUS BIDENS* (LINNAEUS, 1758) FROM THE ORIENTAL AMAZON

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Among the Dolichoderinae subfamily the genus *Dolichoderus* is quite common and currently comprises 35 described species in Brazil. These are usually arboreal species that inhabit tropical regions highly active in daylight time. Normally the nest of these species can be found in the trunk or the top of the trees or dead wood of fallen trees. The cytogenetics comprehends a field of the genetics that investigates the chromosomes and its morphology, evolution and organization. The use of the available cytogenetics data make possible to understand phylogenetic aspects of some groups because usually the similar the karyotypes of a group of species the closer the phylogenetic relationship between them. However the lack of cytogenetic data from Amazon rainforest species makes difficult to construct relationships between groups using chromosome data. Therefore the aim of this study was to investigate the karyotype of the species *Dolichoderus bidens* from the Oriental Amazon rainforest. Two colonies were collected at the municipality of Oiapoque, state of Amapá in Brazil. They were acquired in an area of traditional subsistence agriculture, close to the urban settlements but still characterized by the typical rainforest phytophysionomy. Both colonies were in carton nests and were built under the leaves of plants of the family Musaceae. The workers of *D. bidens* were highly aggressive in all branches of the trees, making almost impossible to reach the nest. The chromosomes were obtained from the tissue of brain ganglia of living larvae. The sampled tissues were submitted to a hypotonic-colchicine solution and fixed in histological slides. Once fixed the slides containing the tissue were stained with Giemsa and analyzed in optical microscopy. The species *D. bidens* showed $2n=18$ chromosomes (14m+4sm). It was also possible to detect blocks of heterochromatin around the centromeric area of many chromosomes. These results show that the studied specimens from the Amazon rainforest had the same chromosome number and similar morphology of populations of *D. bidens* specimens from the Atlantic rainforest. *Dolichoderus bidens* already have been collected at French Guiana and the south of the Amapá state but there were not any information about this taxa between these two areas. Until now the karyotype of *D. bidens* was available only for Atlantic rainforest. Only few studies using population approaches were performed for Neotropical ant species. Furthermore cytogenetic data from distant populations is essential for the understanding of the chromosome evolution of widely distributed taxa. (UNIFAP)

**3.5.22 KARYOTYPE OF *CAMPONOTUS RENGGERI*
(HYMENOPTERA: FORMICIDAE) FROM A FRAGMENT
OF CERRADO**

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Chromosomes arrangement vary in number and morphology and its variance is an important tool for evolutionary and systematic studies. Cytogenetic data has shown that karyotypic evolution, in social insects, tends to increase the number of chromosomes while reduces its length. Ants make up one of the groups with the highest karyotypic variance and the genus *Camponotus* is the richest group among them, and it's widespread all over the country. However, owing to the complex taxonomy of this genus, this study aimed to cytogenetically characterize *C. renggeri*. Collections occurred in a fragment of Cerrado between pasture areas nearby Quirinópolis-GO. Chromosomes were obtained from brain ganglion of post-defecant larvae, following the methodology proposed by Imai and collaborators in 1988. Slides were inspected through optical microscope and the best metaphases were photographed and characterized according to the nomenclature also proposed by Imai. The chromosome number found was $2n=40$ and it corresponds to all the existing descriptions for the same species from different regions. The largest chromosome found showed 1,19 μm length and the smallest 0,23 μm . It's important to highlight that, different from the other studies with *C. renggeri*, B chromosomes were also observed in every sample, varying in number, from two to five, and in shape. (UEG)

3.5.23 REVIEW OF ANT GENUS *PACHYCONDYLA* SMITH, 1858 IN BRAZIL (HYMENOPTERA: FORMICIDAE)

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The ant genus *Pachycondyla* is a historical problem in the Ponerinae, with a poor delimitation based mostly on plesiomorphies. After the synonymies of Brown's 1995 posthumous publication, this genus came to house a diverse range of species, becoming questionably monophyletic. In 2010, MacKay & MacKay revised the genus, working with almost a hundred species. In 2014, Schmidt & Shattuck proposed a phylogeny for the Ponerinae, breaking *Pachycondyla* (*sensu* Brown) into nineteen genera. *Pachycondyla* is now a neotropical ant genus, with eleven species of litter dwelling and generalist ants. Some notable problems remain, such as the status of *P. harpax*, is it one species or a complex of cryptic species? *P. impressa* also suffers the same situation. Seven of the eleven proposed species of this genus are found in Brazil, with local collections housing rich and well-documented collections of these ants, permitting detailed studies on the occurrences and distribution of these species. Our objectives are to redescribe these species, including their morphological variation, build a new species key and document species distribution in Brazil, including distribution maps. To date we have examined over than 700 samples from nineteen states, representing six of the seven species recorded in Brazil. This material is from DZUP, INPA, collections and loans from several other federal institutions (UFSC, UFAC, UFV, UFRG and more to come). The external morphology of *P. harpax* suggests six distinct morphotypes. The synonymy of *P. cearensis* in *P. inca* is questionable, based on distribution data. *P. constricticeps* may be a deformed *P. striata* specimen, needing a careful examination of many specimens. One species, *P. curiosa*, is probably not a member of the genus due to very different characters. The distribution data we currently have may update some information about occurrence of this genus in some Brazilian states. We may hope to contribute to a better knowledge of the definition of the genus, it's biodiversity and morphology. (UFPR, CNPq)

3.5.24 CYTOGENETICS OF *DORYMYRMEX* SP. FROM SOUTHWEST OF BAHIA, BRAZIL

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The genus *Dorymyrmex*, represented by about 60 species, 10 of them registered to Brazil, and many still to be described, is one of the most diverse and complex of the subfamily Dolichoderinae, from a taxonomical and biogeographical point of view.

These ants construct their nests preferably in open places, sandy regions and with little vegetation cover. They are more frequent in arid or semiarid regions and frequently found in anthropic environments, although some species may present a high degree of endemism. Chromosome studies for this subfamily are scarce and old, taking as a record: *Dorymyrmex thoracicus*, Peru, $n=9$; *Dorymyrmex pyramicus*, Uruguay, $2n=18$; *Dorymyrmex bicolor*, USA, $n=13$, $2n=26$; *Dorymyrmex flavus*, USA, $2n=26$. For Brazil, there is a record of $2n = 18$ chromosomes to *Dorymyrmex pulchellus*. In this way, this work aims to contribute with important cytogenetic information for *Dorymyrmex* sp. from southwestern of Bahia, Brazil. The ants were collected at ground level in an open urban area, Bela Vista neighborhood, in the municipality of Vitória da Conquista, semi-arid region of the state, on 11/27/2018.

In the laboratory, pre-pupal brain ganglia were used to prepare the metaphases, which were stained with Giemsa (conventional staining). Five slides containing the best metaphases were photographed, with thirty-two metaphases used for number and morphological chromosome record. We found $2n = 16$ chromosomes (female) and $n = 8$ chromosomes (male), with metacentric morphology. This chromosome number is within the range known for members of the subfamily Dolichoderinae, which are characterized by a low number of chromosomes, where $2n = 10-28$, with modal number $2n = 18$ chromosomes. The chromosome number obtained is typical of less primitive subfamilies whose number of chromosomes is less variable, and has therefore passed through fewer chromosomal rearrangements. Additional studies should be conducted, such as C-banding, in order to provide chromosomal marking and subsequent mounting of the karyotype for this species, as yet unidentified.

Thus, this study may contribute to support future studies involving species of *Dorymyrmex*. (UESB)

**3.5.25 PHYSICAL MAPPING OF 18S RDNA CLUSTERS OF
SOLENOPSIS GEMINATA (FABRICIUS, 1804)
(FORMICIDAE: MYRMICINAE) FROM FRENCH
GUIANA**

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The so-called fire ants are included in the Neotropical genus *Solenopsis* that nowadays occupy all major biogeographical regions outside the Neotropics. *Solenopsis geminata* is one of the most feared ant species due to its powerful sting. Its colonies are populous and can be found in a wide variety of habitats. The species is highly polymorphic with wide size variation between the colony and also the color of their workers. *S. geminata* is included in the subfamily Myrmicinae that possess the highest number of cytogenetically analyzed species so far, with about 400 species karyotyped with chromosome variation ranging from $2n=8$ to $2n=70$. The use of cytogenetics remains an important tool for understanding the evolution of ant lineages and the molecular cytogenetics is enhanced by the use of molecular biology techniques in order to improve the comprehension of the karyotype. This study aimed to describe the karyotype of the fire ant *S. geminata* from the Amazon region, including its physical mapping of 18S rDNA clusters. The larvae were obtained in Sinnamary, French Guiana and the mitotic metaphases were obtained by dissecting cerebral ganglia after the elimination of meconium employing colchicine-hypotonic solution and fixatives. To determine chromosome morphology, metaphases were analyzed using conventional 4% Giemsa staining. The chromosomes were measured, paired and ranked in a decreasing order of size to determine the karyotype. Ribosomal 18S gene clusters were detected by Fluorescence in situ Hybridization (FISH), with the use of 18S rDNA probe obtained by polymerase chain reaction and indirect marked. *S. geminata* showed $2n=32$ with karyotype formula $2n=14m+12sm+6st$ and the male karyotype showed $n=16$ ($7m+6sm+3st$). This is the same chromosome number observed in six previously described fire ant species. Besides, colonies of *S. geminata* from the USA and India were studied, and the karyotype from French Guiana in the present work is similar to them. Clusters of 18S rDNA were observed in the pericentromeric region of short arms of the smallest submetacentric chromosome pair. The majority of Neotropical ant species with rDNA physically mapped on their karyotype show only one chromosome pair bearing such DNA clusters and *S. geminata* follows this pattern. However the lack of amazonian ant species cytogenetically studied with FISH techniques restrain the ability to discuss the chromosome evolution of ant lineages and highlights the importance of new surveys on Amazon species. (OHM Oyapock, CNPq, UNIFAP)

3.5.26 MOLECULAR DIVERSITY OF *SOLENOPSIS INVICTA* BUREN, 1972 IN ATLANTIC FOREST AREAS

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The *Solenopsis saevissima* species complex includes 14 species, all native to South America. When introduced in new environments, some species can cause damage to fauna, flora, and agriculture. Species *Solenopsis invicta*, considered a pest of economic importance in many places where it was inserted, has its origin center in the sub-Amazonian region of South America. Notwithstanding, this species has increased its area of occurrence in the last decades, including, for example, the Atlantic Domain in São Paulo State. Analyses made with *mtDNA* and nuclear DNA evidenced multiple invasions with significant loss of molecular diversity of the introduced populations when compared to the area of natural occurrence. Therefore, this study uses *mtDNA* to analyze molecular diversity and to verify the genetic distance and the correlation between the genetic and geographic distance of *Solenopsis invicta*. Specimens were collected in Dense Ombrophilous Forest areas located in Alto Tietê and in the north coast of São Paulo State, Brazil. In total, we used workers from 18 nests, and sequenced the DNA of two workers from each nest. The sequences were compared with samples obtained from different regions of Brazil and deposited in GenBank according to published articles. The results of the molecular diversity analysis defined four mitochondrial haplotypes: H1, H2, H3, and H4. We also observed the formation of two distinct groups for these haplotypes. The results for genetic distance also show the formation of two groups, with less than 1% difference. However, when comparing the two groups of haplotypes (H1/H2 - H3/H4), the genetic distance is higher than 6%, thus indicating a high rate of transition and transversion mutation. The correlation between the genetic and geographic distance was significant. Results suggest that H1 and H2 may have been introduced in the studied areas by the São Sebastião Port, whereas H3 and H4 are likely to be from populations from Paraná. The study areas are close to native Atlantic Forest, and the frequency of *S. invicta* needs to be monitored, since this species can cause several negative impacts on the balance and conservation of biodiversity. (FAPESP, CNPq, CAPES)

3.5.27 IMPROVING OCR QUALITY SCORES OF SCANNED MYRMECOLOGICAL TAXONOMIC LITERATURE USING PERSONALIZED DICTIONARIES.

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Biology and natural history have among the deepest historical records, while observations on morphology, anatomy and other properties of biological taxa have been accumulating since the dawn of scientific publication. We would expect our changing understanding of diversity in the natural world to be manifested in the literature through the introduction of novel anatomical and morphological concepts as well as changes in the usage of existing concepts. With access to much of this literature in digital form, we are in a position to quantitatively explore patterns in the evolution of how biological concepts have changed in meaning over time. However, we still face problems while obtaining a lot of data from legacy literature due to low-quality results from data mining. Hence, exploring strategies to recover data from texts, including historical ones, is fundamental to understand how anatomical and morphological concepts and knowledge evolved through time. We evaluated the efficiency of optical character recognition (OCR) on myrmecological taxonomic literature using personalized dictionaries (*i.e.* list of terms). A random sample of 300 articles, spanning from 1880-2018, was obtained from a corpus containing 641 documents on ant taxonomy. All articles were recovered as .pdf files and converted to raster images through the ImageMagick application suite using default pre-processing specifications. Images were submitted to optical character recognition using Tesseract and saved as raw text files. Each raw text file was submitted to an open source script called OCR normalizer to correct common errors such as s/f substitutions, words divided across line breaks, etc. A set of dictionaries were prepared to quantify OCR scores and contained the following: English words and abbreviations (EA); subfamilies, genera and specific epithets (SG); and concept names from three anatomical ontologies (CN). Each file was submitted to seven distinct treatments in order to evaluate differences in scoring values: i) only EA dictionary; ii) only SG dictionary; iii) only CN dictionary; iv) EA+SG dictionaries; v) EA+CN dictionaries; vi) SG+CN dictionaries; vii) all dictionaries. The percentage of recognized words in each document was used as an OCR quality score and the quality score of each treatment was compared to the others. Partial results indicate that personalized dictionaries improve quality scores in more than 50% in three treatments. However, results also indicate that only one treatment recovered high-quality results (>60%), suggesting that OCR quality may be affected by other aspects, such as fine-tuned pre-processing configuration of images. (UFPR, CAPES)

3.5.28 MOLECULAR MARKERS AS COI AUXILIARIES IN THE IDENTIFICATION OF *SOLENOPSIS* SPECIES (HYMENOPTERA: FORMICIDAE)

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The morphological identification the *Solenopsis* genus is complex due to its high diversity in South America, occurrence of cryptic species and the absence of conclusive diagnostic by morphological characters. Studies show the processes of speciation, hybridization and existence of intraspecific polymorphisms, which makes identification even more difficult. The DNA Barcode technique (COI) is widely used in these cases. But, errors can occur in insufficiently studied paraphyletic groups or with taxonomic problems, such as *Solenopsis*. The objective of this work was to investigate whether different genes and some EPIC regions corroborate the COI based identification. The collections were carried out in the cities of Biritiba-Mirim, Salesópolis and Mogi das Cruzes, as well as roads. After DNA extraction, PCR and sequencing was performed using the genes fragments 18S, 28S, CAD, EF-1a, LR, Wg and Gp-9, as well as the regions EPIC1, EPIC384, EPIC965, EPIC1087, EPIC2225, EPIC1281. Of these, only Gp-9 was cloned. Bioedit software was used to edited and aligned all the data, which was later analyzed on DnaSP v6.12.01 to investigate the haplotypes; and Mega 4.0 to generate dendrograms of similarity. Three species were identified by the DNA Barcode technique: *Solenopsis invicta*, *S. saevissima* and *S. macdonaghi*. Among the other molecular markers, only the Gp-9 gene and the EPIC1 region have shown to be promising for species distinction. In addition, they corroborated the COI results for *S. invicta* and *S. saevissima*. However, the specimens identified by the COI as *S. macdonaghi* are grouped with both *S. saevissima* and *S. invicta*. This result suggests: (1) an error in species identification in GenBank, (2) high genetic polymorphism that may be causing ambiguity in clusters, and (3) hybridization. (FAPESP: processo n.2015/05126-8, FAEPE, CAPES).

3.5.29 AN OUTLINE OF THE PONERINI SPECIES DIVERSIFICATION: CYTOGENETIC ANALYSIS USING A MOLECULAR PHYLOGENETIC APPROACH

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Ants exhibit a high karyotype diversity that is suggested to be correlated to their diversification. The "poneromorph" ants have numerous "basal" or "ancestral" morphological and behavioral characteristics. Basal ants show not only the highest range of variation in chromosome number but also the most complex chromosome polymorphisms. Ponerinae is a poneromorph subfamily, whose 143 chromosome numbers indicate a large intrageneric variation. Within Ponerinae, the tribe Ponerini currently comprises 46 genera but only 21 genera have species that have been cytogenetically described. The present study aimed to compare the karyotype evolution of the Ponerini tribe according to available information mainly on molecular phylogeny and morphology. Ponerini is divided into six informal genus groups based on molecular phylogenetic results and the monophyly of each group is well supported. The analysis presented here was based on morphology and chromosome number. The diploid number (2n) frequency, the relationships among the genera represented by the monophyletic groups of Ponerini and the diploid number (2n) of chromosomes for each genus group, with the aid of the mean, standard deviation and standard error of karyotypes were compiled from the literature and combined with additional unpublished data. The number of chromosome arms (2AN) as a function of the number of chromosomes of each species (2n) were plotted. A karyograph was built for the three most sampled monophyletic groups and an outline of the karyograph for the Ponerini was built. We observed that when the karyotypes have high chromosome numbers, chromosome morphology is generally acrocentric and these karyotypes were mainly originated from centric fission. By using the karyographic method, it was possible to corroborate some points in the current phylogenetic classification. For example, *Pachycondyla* is considered a sister-genus of *Dinoponera*, and these are distributed in a near and well defined space in the karyograph of the *Pachycondyla* genus group. Next to these was *Neoponera*, clustered in the central region of the karyograph. In the *Odontomachus* genus group, the genera *Brachyponera* and *Cryptopone* appear close in the karyograph and they are also phylogenetically very close. It was also possible to observe that the sampled genera of the Ponerini tribe were arranged in the karyograph in distinct regions and relatively clustered according to the monophyletic groups. This study represents a contribution to Ponerini taxonomy, since it helps the understanding of the evolutionary mechanisms that probably occurred within the tribe. (CNPq)

3.5.30 LOW-BUDGET SCIENCE AND THE PRODUCTION OF COMPLETE AND NEARLY-COMPLETE MITOGENOMES OF *TEMNOTHORAX* ANTS USING PUBLIC DATA

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Mitochondrial genomes (mitogenomes) are widely used for studies in Populational Genetics, Phylogeography, Conservation and Phylogenetics. The mitogenome contains 37 genomic features, being 13 protein-coding genes (PCGs), 22 tRNAs and 2 rRNAs. It is relatively straightforward to assemble and annotate a mitogenome once it is the smallest genome in a metazoan cell (~16 kbp), being present in high copy number. Mitochondrial genomes can be found and assembled from several sequencing strategies, such as WGS, RNA-Seq and Targeted Sequencing. Even though public genomic datasets are available for hundreds of ant species in the Sequence Read Archive (SRA) database, complete mitogenomes are available for only 35 ant species at GenBank. The ant genus *Temnothorax* is an interesting candidate for mitogenomic studies: it presents a considerable amount of public UCE sequencing data available, but no complete mitogenome assembled and published. Here we will: (i) demonstrate the feasibility of obtaining mitochondrial genomes from UCE datasets and (ii) analyze these sequences in order to shed light on *Temnothorax* mitochondrial evolution and phylogeny. We have downloaded raw public datasets for 30 *Temnothorax* species from the SRA database at the NCBI. The datasets were converted to fastq using sratoolkit2.8.2 and their respective mitogenomes were assembled using both NOVOPlasty2.7.2 and MITObim1.9 software. Automatic annotation was performed using MITOS Web Server followed by manual curation. We have constructed a preliminary neighbor-joining phylogenomic tree (with 1000 bootstrap replicates) using the concatenated set of all 13 mitochondrial PCG's for these datasets plus most complete mitogenomes available for ants, totalling 54 ant species. Two bee species were added as outgroups. We successfully assembled 30 *Temnothorax* mitogenomes (22 complete and 8 partial) from public data. This preliminary phylogenomic tree largely confirms previous studies, reassuring the monophyly of both (i) the Ponerinae and Pseudomyrmecinae ant subfamilies, and (ii) the *Temnothorax* genus. However, several nodes were shown with low bootstrap values. We intend to refine this phylogeny and perform synteny and comparative genomics analyses. Upon completion, this study will contribute to ant mitogenomic resources and evidence the vast potential of public databases in fostering new projects of ant evolution. Since using public data eliminates sequencing costs, this approach has been referred as "Low-Budget Mitogenomics" and hopefully it will support further improvements on diversity and evolution studies for ants and other taxa.

3.5.31 MITOFREE: AN AUTOMATED PIPELINE FOR MITOGENOME ASSEMBLY, ANNOTATION AND PHYLOGENOMIC ANALYSIS USING PUBLIC DATA

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The Sequence Read Archive (SRA) is the largest public database of raw sequencing data, featuring WGS, RNA-Seq, Exome and other types of sequencing datasets. These data can be used to obtain partial and complete mitochondrial genomes (mitogenomes), useful in population genetics, evolutionary and phylogeography studies. We noticed a large number of species with public data available in SRA but lacking mitogenome sequences. SRA presents hundreds of datasets containing sequencing data from ants that covers more than 17 subfamilies. Nevertheless, GenBank present only 35 complete mitogenomes for the clade, barely encompassing six subfamilies. Thus, the use of public data for mitogenomics might bring light in studies focusing ant diversity, habitat colonization, dispersion and evolution. In order to make mitogenomics accessible to researchers who do not have access to heavy bioinformatics infrastructure or do not have bioinformatics expertise, we are developing MitoFree, a lightweight Python script that automates assembly, annotation and phylogenomic analyses based on public sequencing data. The program works through a simple input file that has three columns per line, each containing specific information: (i) run number of the public dataset; (ii) species' name; and the (iii) accession number of a mitochondrial sequence of a nearby organism (seed) used to initiate the assembly. The input file is read by the program and each line starts a new assembly. When fully implemented, MitoFree will automatically download the SRA dataset and convert it to fastq using the "fastq-dump" script of the sratoolkit package. Then, it will perform an mitogenome assembly using NOVOPlasty software, followed by a second, complementary MITObim assembly that aims to close eventual gaps and provide read mapping coverage for the mitogenome. These assemblers are very efficient in terms of RAM usage, a feature that allows MitoFree to be run on standard personal computers. The mitogenome will be annotated using either MITOS Web Server or GeneChecker and it will generate the files required for submission of the assembled mitogenome sequences into Genbank. Afterwards, a phylogenomic tree will be constructed using the concatenation of all 13 mitochondrial protein-coding genes through Phylomito and PartitionFinder2. The development of the project can be followed at <https://github.com/gavieira/mitofree>, on which a beta version is available. MitoFree Beta version is capable to download SRA datasets and assemble them into mitochondrial contigs. We aim to make mitogenomic studies as widespread and relevant as possible, fostering and expediting developments on the study of numerous clades, especially Formicidae.

**3.5.32 CHROMOSOMAL DATA OF GENUS *ALLOMERUS*
(FORMICIDAE: MYRMICINAE) FROM FRENCH
GUIANA AND ITS ECOLOGICAL IMPLICATIONS:
FIRST CYTOGENETIC REPORT**

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Karyological data in Formicidae has permitted inferences regarding different aspects of biology, reproduction, phylogeny, taxonomy, evolution and to investigate cryptic and threatened species. Most cytogenetic studies concerning Neotropical region are concentrated in the Atlantic Forest in Brazil. Only a few data are so far available from the Amazon region. The species from genus *Allomerus* inhabit internal cavities or plant structures in South America and the *Allomerus*-plants association is of great biological interest for investigations in ant-plant associations and coevolution. *Allomerus* ants have been intensively studied in French Guiana in terms of their interactions with plants and their ability to build galleries using a fungus. From these studies, it appears that *A. octoarticulatus* is a species complex composed of at least two species that can be differentiated by their host plants. One is restricted to the association with *Cordia nodosa*, while the other inhabits a diversity of myrmecophytic plants over its distribution range. No karyological data are currently available for the genus *Allomerus* thereby highlighting the significance of this study. Therefore this study aimed to define the chromosome configuration of *O. decemarticulatus* and both lineages of *O. octoarticulatus*. Metaphasic chromosomes were harvested from the brain ganglia of the larvae. The brain tissue was treated with hypotonic-colchicine solution and fixatives and after that the slides were stained with Giemsa. *A. decemarticulatus* and *A. octoarticulatus* presented $2n=28$ (18m+6sm+2st+2t) and $2n=44$ (4sm+40t) chromosomes, respectively. It is also remarkable that the number of telocentric chromosomes is highly different between them. *A. decemarticulatus* shows a predominance of meta/submetacentric chromosomes while *A. octoarticulatus* is rich in telocentric chromosomes. Accordingly to the Minimum Interaction Theory it is possible that centric fissions played an important role in the chromosome evolution of *Allomerus*, however the karyotype of additional species should be investigated to strengthen this conclusion. A comparison between two lineages of *A. octoarticulatus*, which nest in different plant species was made, however using basic cytogenetic techniques it was unable to distinguish between these two lineages of *A. octoarticulatus*. Nonetheless, the use of additional banding techniques with molecular probes may provide novel insights into this in future studies. (OHM Oyapock, UNIFAP)

3.5.33 CHROMOSOMAL VARIABILITY IN POPULATIONS OF *GNAMPTOGENYS MOELLERI* FOREL (FORMICIDAE: ECTATOMINAE)

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Cytogenetics has been a useful tool in the study of cryptic species and species complex in ants, helping to delimit the taxa by pointing to karyotypic differences that included variations in the number, morphology, pattern of chromosomal banding, and the distribution of ribosomal gene clusters. In *Gnamptogenys*, classical cytogenetic data are available for 10 of the 138 Neotropical species, with representatives for the morphological groups *striatula*, *rastrata* and *mordax*. *G. moelleri* belongs to the *striatula* group and is widely distributed in Brazil. Distant populations cytogenetics studies conducted in ants showed karyotypic variations intraspecific, highlight the importance of this type of study. Thus, this study aimed to characterize cytogenetically three Brazilian populations of *Gnamptogenys moelleri* describing chromosome number, morphology and distribution of 18S rDNA clusters. The colonies were collected in highland and agricultural areas of the Atlantic rainforest from the localities of Petrópolis-RJ and Viçosa-MG, respectively and in the Amazon rainforest from the locality of Açailândia-MA. Mitotic metaphases were obtained from cerebral ganglia of the larvae after meconium elimination, submitted to colchicine-hypotonic solution and fixatives. The 18S rDNA clusters were mapped by Fluorescent *in situ* Hybridization. *G. moelleri* presented $2n=34$ chromosomes ($2n=18m+8sm+8st$) in both populations of Atlantic rainforest, whereas $2n=44$ ($2n=22m+14sm+8st$) was observed for the Amazon population. However, all studied populations showed the 18S rDNA clusters at the interstitial region of the short arm of the fifth metacentric pair. The populations of *G. moelleri* from the Atlantic rainforest presented similar karyotypes to *G. striatula*, also collected in Atlantic rainforest with $2n=34$, suggesting a plesiomorphic configuration within the *striatula* subgroup. The karyotype of *G. moelleri* from Amazon rainforest ($2n=44$) may be considered more derivative. In *G. moelleri*, the diagnostic characteristics in this species remain well-defined throughout their distribution gradient. Nevertheless, the amplitude of the karyotype divergence of the Amazon population ($2n=44$), compared to the other populations from the Atlantic rainforest ($2n=34$), indicates the existence of cryptic species within this taxon or a species complex gradually varying with intermediate karyotypes between these two distant localities. Thus, investigating the karyotype of other populations of *G. moelleri* is important to better understand the mechanisms involved in the drastic modification of the karyotype of this Amazon rainforest population studied and will be useful in the validation of the suggested hypothesis. (CNPq, CAPES)

3.5.34 KARYOLOGICAL DATA OF FOUR FUNGUS-FARMING ANT SPECIES FROM NORTH-EASTERN AMAZONIA

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The use of cytogenetics in Formicidae has contributed in taxonomic knowledge of the species studied so far. Over the past several decades, Neotropical ant cytogenetic studies have been focused in the Atlantic Forest in Brazil. Little data is available regarding other regions and countries. Populational studies in ant cytogenetics still remain scarce and were conducted for a few species. The present study aimed to increase the understanding about *fungus-farming ants* cytogenetics by the karyotype characterization of the species *Atta sexdens* Linnaeus, 1758, and *Acromyrmex balzani* Emery, 1890, *Cyphomyrmex transversus* Emery, 1894, and *Myrmicocrypta* sp. collected in French Guiana, Oriental Amazon. The metaphases were obtained from cerebral ganglia of the larvae after meconium elimination. Metaphases were analyzed using Giemsa staining to study chromosome number and morphology. The karyotypes were defined using the ratio of chromosome arms (long arm/short arm). *Atta sexdens* presented $2n=22$ chromosomes ($18m+2sm+2st$), and chromosome morphology similar to those of other *Atta* species already studied in the Brazilian savannah and Atlantic Forest. *Ac. balzani* showed $2n=38$ chromosomes ($12m+10sm+14st+2t$) and the same karyotypic formula as other populations already studies in Brazil. Cytogenetic studies with a population-based approach were unavailable for leaf-cutter ants. The cytogenetic report on Amazonian populations of *A. sexdens* and *Ac. balzani* allowed for population comparisons, enriching the cytogenetic knowledge of attine. *Cyphomyrmex transversus* presented $2n=24$ ($14m+6sm+4t$) and $n=12$ ($7m+3sm+2t$) chromosomes, mostly metacentric and submetacentric chromosomes. So far, only three other *Cyphomyrmex* species (considering the recent taxonomical changes) have been karyotyped, and among these four species, the chromosome numbers range from $2n=20-32$. It seems that the high proportion of metacentric chromosomes is a karyotype characteristic of this genus. *Myrmicocrypta* sp. had $2n=30$ chromosomes ($22m+2sm+6t$) and most of the chromosomes are metacentric, but there are three telocentric pairs. There is also one remarkably large submetacentric pair. The colony studied was collected from the cavities of rotten logs that is considered is a derived characteristic in *Myrmicocrypta*. A recent study suggests that only two species nest in rotten logs: *M. spinosa* and the undescribed species *M. JSC001*. It is possible that the present species corresponds to *M. JSC001*. The only cytogenetic report available for this genus thus far is from Montagne des Singes, French Guiana, a locality near Sinnamarie, where the samples from the present study were collected. This study increases karyotype information from French Guiana with new karyotype data and also contributed to comparative data of distant localities. (OHM Oyapock, CNPq, UNIFAP)

**3.5.35 CHROMOSOMAL CHANGES IN SPACE AND TIME:
THE CASE OF *MYCETOPHYLAX* SPECIES ENDEMIC
FROM SAND DUNE ENVIRONMENTS**

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Fungus-farming ants of the genus *Mycetophylax* exhibit intra and interspecific chromosome variability, which makes them suitable for testing hypotheses about possible chromosomal rearrangements that endure lineage diversification. We combined cytogenetic and molecular data from *Mycetophylax* populations from coastal environments to trace the evolutionary history of the clade in light of chromosomal changes under a historical and geographic context. We used a highly conserved 18S rDNA probe by means of Fluorescence in situ Hybridization (FISH) to identify possible chromosome rearrangements within the lineages. We further used five nuclear gene segments that were added to the previous phylogenetic tree of fungi-farming ants to estimate their phylogenetic relationships by Bayesian inference. The time taken for divergence lineages was estimated by the Fossilized Birth-Death (FBD) process with a relaxed molecular clock. Subsequently, we used phylogenetic trees that were generated plus known chromosomal numbers to estimate the karyotypic ancestry and we incorporated the biogeographic information of the lineages for ancestral range estimation by comparing alternative biogeographic models. Our cytogenetic analyses revealed chromosomal differences within and among species. *Mycetophylax morschi* exhibited three distinct karyotypes and considerable variability in the localization of 45S rDNA clusters. The molecular phylogeny was congruent with our cytogenetic findings. Biogeographical analyses and divergence time dating estimated that the most recent common ancestor of *Mycetophylax* would have originated at about 30 million years ago (mya) in an area including the Amazon and South America Grasslands, and several dispersion and vicariance events may have occurred before the colonization of the Brazilian Atlantic Coast. Diversification of the psammophilous *Mycetophylax* first took place in the Middle Miocene (ca. 18–10 mya) in the South Atlantic Coast, while “*M. morschi*” lineages diversified during the Pliocene-Pleistocene transition (ca. 3–2 mya) through founder-event dispersal toward the Northern coastal regions. Psammophilous *Mycetophylax* diversification fits into the major global climatic events that have had a direct impact on the changes in sea level as well as deep ecological impact throughout South America. We assume therefore that putative chromosomal rearrangements correlated with increased ecological stress during the past climatic transitions could have intensified and/or accompanied the divergence of the psammophilous *Mycetophylax*. We further reiterate that “*M. morschi*” comprises a complex of at least three well-defined lineages, and we emphasize the role of this integrative approach for the identification and delimitation of evolutionary lineages. (UFOP, UFPR, CNPq, CAPES, FAPPR)

3.5.36 POTENTIAL DISTRIBUTION AND TAXONOMIC NOVELTIES IN THE ANT GENUS *STEGOYRMEX* EMERY, 1912 (HYMENOPTERA: FORMICIDAE)

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The study of taxonomy and distribution of ant species that inhabit the soil is crucial to understanding their role in the environment. *Stegomyrmex* Emery is known from five species (*S. bensoni* Feitosa *et al.*, *S. connectens* Emery, *S. manni* Smith, *S. olindae* Feitosa *et al.*, and *S. vizottoi* Diniz) and, due to their cryptobiotic habits, specimens are infrequently collected. After conducting field expeditions and examining specimens in collections, a number of new records and taxonomic novelties for the genus was found. In this way, the goal of this work is to provide new occurrence data and potential distribution of the species and to report the discovery of undescribed queens and of a probable new species. Of the 195 records raised in this study, 12 are reported here for the first time, with five new records for *S. bensoni*, two for *S. manni*, four for *S. olindae* and a single record for *S. vizottoi*. Maps with the potential distribution model were generated for three species (*S. manni*, *S. olindae*, and *S. vizottoi*) using the Maxent 3.3.3e. *Stegomyrmex manni* was the species that presented the largest latitudinal gradient of distribution. In addition to the distribution previously known, our analysis showed a probable presence of this species on the coast of Northeast Brazil and absence in the areas of arid climate. While *S. olindae* occurs in Brazilian savanna regions, with potential distribution in the Amazon, especially in the southern parts of the region. *Stegomyrmex vizottoi* presented potential distribution similar to that already known, with a strong presence in the South region and along the Brazilian coast. In general, the potential distributions of the species indicate preference for biomes with presence of forest cover, such as the Amazon and Atlantic Rainforest, both in areas under strong anthropogenic pressure. In addition, we recorded for the first time queens not yet described for *S. bensoni* and *S. manni* species and a probable new species known by a single worker, collected in the state of Pará (Brazil). This species is morphologically similar to *S. manni*, distinguished by relatively larger body-size, sculpture of head dorsum, and mesosoma shape. (CAPES, CNPq).

**3.5.37 REVIEWING THE GENUS *ROGERIA* EMERY, 1984
(HYMENOPTERA: FORMICIDAE): TAXONOMY AND
DISTRIBUTION OF SPECIES IN BRAZIL**

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Ants of the genus *Rogeria* are distinguished by the 12-segmented antennae with a distinct 3-segmented club; antennal scrobes or fossae absent; mesosoma generally compact and broad shouldered; short propodeal spines and propodeal lobes without projections. The distribution of *Rogeria* is disjunct, with about 37 species in Neotropical region and three in the Australasian region. So far, 23 species are known from Brazil. The global revision of Kugler (1994) offers morphological criteria for species delimitation, species keys, species groups, and taxonomic notes on 39 species. After this work, only a single taxonomic study on the genus was developed, although restricted to species occurring in Guyana where eleven species were recorded, including a new one, *R. tsumani* Lapolla and Sosa-Calvo, 2006. A large amount of specimens of *Rogeria* has accumulated in all Brazilian collections because of the raise in the last 20 years of more efficient collection techniques for the ant fauna. Considering that, a taxonomic study of *Rogeria* is being carried out in order to understand its delimitation, distribution, and natural history. At the moment, the study is based on material from Brazil's main myrmecological collections. To date, 564 specimens have been examined, with 26 species recognized for Brazil, of which three are possibly new. The genus is recorded for the first time in three Brazilian states (Amapá, Piauí, and Tocantins) and new records for species are presented for at least four states (Bahia, Goiás, Espírito Santo, and Maranhão). Although the lack of biology data for *Rogeria* species in the literature, ants in this genus are considered ground foragers commonly associated with forest environments. We sampled whole colonies of two species (including queens and brood) under the soil and inside fallen twigs in the Amazon and Atlantic forest. We hope this study can contribute to the increase of the taxonomic, biological and biogeographic knowledge of *Rogeria*. (MPEG, UFPA, CNPq)

3.5.38 THE BIOSYSTEMATICS OF HUNTING ANTS OF THE GENUS *NEOPONERA* EMERY (HYMENOPTERA, FORMICIDAE) WITH FOCUS ON BRAZILIAN SPECIES

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The Neotropical ant genus *Neoponera* is the seventh largest within the subfamily Ponerinae. Although virtually nothing is known about the biology of most species, what little we know gives account of a rich variety in their behavioral ecology, which mirrors a possibly fast evolutionary radiation on which scarce information has been published. A few common species are easily recognizable at a glance, however, from the current 57 formally accepted names most must be identified using partial treatments and a general revision. None of these used a phylogenetic framework in their species-level classification, and the latter work did not include most material from the currently fast-growing Brazilian ant collections. Our objectives are: i. To construct a phylogenetic framework to the classification of the genus which will allow testing its monophyly; ii. To fill gaps left by previous studies by describing and re-describing species, and updating their distribution. Heading in that direction we have been gathering and systematizing material from major Brazilian institutions as well as from other South American countries, when possible. Thus far, we have classified ca. 2000 specimens representing 44 species which are distributed in nearly 500 localities, 60% of which are scattered across five Brazilian Biomes. All 38 species recorded for Brazil are now represented in this data set, however, since some specimens probably represent new species that number may increase up to at least 50 species, some of which are singletons, requiring therefore further sampling and/or examination of additional material in collections. Among some initial highlights, we have found that at least two species do not belong to *Neoponera*, one of these may even prove to be a new ponerine lineage of generic rank. Further work includes finding and analyzing the remaining 13 species, some of these known from single individuals and others from which only the original description is available. (UFPR)

3.5.39 DRIVERS OF DIVERSIFICATION IN A WIDESPREAD SPECIES COMPLEX WITHIN THE CONTINENTAL ADAPTIVE RADIATION OF THE TURTLE ANTS (*CEPHALOTES*)

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Understanding patterns of biodiversity requires identifying the relative contributions of geographic isolation and ecological opportunity in species diversification. Speciation in the absence of gene flow, allopatry, leads to species differentiation over time. Species diversification, however, may also occur in sympatry (i.e. the overlapping range of taxa within a geographic area) through adaptation to divergent selection in response to different ecological niches. Under this scenario, exposure to open niches acts as ecological opportunity, releasing species from competition, ultimately resulting in an array of ecologically and phenotypically differentiated species occupying diverse niches. Thus, geographic barriers to gene flow and ecological factors may both influence diversification, but the relative importance of each process is poorly known, particularly at the continental level where spatial scales are large and geographic isolation between species is less discrete. In this study, we investigate the evolutionary relationships within the turtle ant species, *Cephalotes maculatus*. *Cephalotes* is a New World genus that is an adaptive radiation and is notable for its species richness and morphological differentiation among species, including numerous distinct species with small endemic distributions. Nevertheless, *Cephalotes maculatus* is an exceptionally widespread species that occurs from Mexico through Argentina. This species exhibits relatively uniform worker morphology but is widely distributed across diverse habitat types from closed canopy, wet rainforest to open, dry cerrado environments. We critically evaluate if *Cephalotes maculatus* is one or a small number of species with gene flow across broad continental distributions; or if *Cephalotes maculatus* is a complex of many species across its range because of geographic isolation at the sub-continental scale (nonadaptive differentiation), or ecological diversification (adaptive differentiation). Preliminary phylogenomic analyses utilizing ultraconserved elements (UCEs) reveal at least three separate lineages within *C. maculatus*. Additionally, investigation of the rarely-collected soldier caste reveals morphological differences absent from the worker caste, suggestive of ecological specialization. On-going analyses currently in progress encompass a wider geographic range to help understand the full extent of diversification within *C. maculatus*. The results of this study will contribute novel insights into the mechanisms of diversification in a continental radiation by identifying the factors that drive genetic divergence in the face of morphological stasis and with the occupation of diverse biogeographic regions. (GWU, SI-NMNH, NSF-DEB 1442256)

3.5.40 TOOLS FOR STUDYING ANT INVASION BIOLOGY—POPULATION GENETICS AND PHYLOGENOMICS MEET APPLIED ENTOMOLOGY

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The taxonomic instability among globally-invasive ants is a real-world problem that needs to be addressed at multiple levels. Molecular tools are needed to reconstruct biogeographic histories, identify species- and population-level units, and stabilize nomenclature. Many ant species are difficult to associate with stable names because of chaotic underlying taxonomy, particularly in morphologically uniform, species-rich groups. We tested the ability of Ultraconserved Elements (UCEs) to resolve overlapping phylogenetic and taxonomic problems, simultaneously at multiple levels, in the ant genus *Nylanderia*, which has a history of taxonomic confusion. *Nylanderia* contains more than 130 described and an estimated 100 yet undescribed species. More than a dozen species have widespread exotic ranges; nearly all are plagued by uncertain names, species boundaries, and region of origin. Our first goal was to understand the biogeographic history of the genus, so we reconstructed and dated the first global phylogeny of *Nylanderia* using representatives spanning all seven biogeographic regions in which the genus occurs. Our results confirmed the monophyly of the genus and identified four distinct biogeographic clades—Nearctic, Australasian, Afrotropical, and Neotropical. The stem origin was reconstructed as mid-Eocene (~44.6 mya, Palearctic) and the crown group dated to the Oligocene (~32.8 mya, Indomalaya). Second, we asked how many lineages gave rise to globetrotting species. Our global phylogeny indicates that the nine widespread exotic taxa arose from six independent lineages originating in three biogeographic regions. Finally, we tested the integrity of species boundaries for six difficult-to-diagnose widespread exotic taxa. Our results suggest that two pairs of morphologically similar species, *N. bourbonica* + *N. vaga* (Indo-Australia) and *N. fulva* + *N. pubens* (Neotropical), are indeed reciprocally monophyletic, while *N. steinheili* and *N. guatemalensis*, are reciprocally paraphyletic. These results demonstrate that a phylogenomic approach using UCEs can help resolve taxonomically challenging groups at multiple scales. *Nylanderia* taxonomy can now advance with a stable phylogenetic framework; this includes resolving names of species with high invasion potential and determining useful morphological characters for species-level discrimination. This approach should be effective across ant taxa, and represents an essential step towards invasive species monitoring and management by stabilizing species identities.

3.5.41 ANT FAUNA (HYMENOPTERA: FORMICIDAE) OF THE STATE OF QATAR

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The State of Qatar is a small peninsula which located in the northeast part of the Arabian Peninsula. It is classified as a subtropical desert with a very extreme harsh climatic conditions in summer and mild winter. Information on Formicidae of Qatar as well as insect fauna is poorly documented, so far only seven species of Formicidae (ants) belonging to five genera have been recorded from Qatar; *Brachyponera sennaarensis* (Mayr, 1862), *Cataglyphis niger* (André, 1881), *Camponotus maculatus* (Fabricius, 1782), *Monomorium tumaire* (Collingwood and Agosti, 1996), *M. pharaonis* (Linnaeus, 1758), *Trichomyrmex destructor* (Jerdon, 1851) and *Trichomyrmex mayri* (Forel, 1902) (Abdu and Shaumar, 1985; Abushama, 1997; Lush, 2009; Wetterer, 2013 and Sharaf *et al.*, 2016). At least 300 ant species have been recorded from Arabian Peninsula (Collingwood *et al.*, 2011). For instance, Collingwood and Agosti (1996) reported a list of 265 ant species in Saudi Arabia. Collingwood *et al.* (2011) published a list of more than 120 ant species in UAE. Sharaf *et al.*, (2017) recorded 28 ant species from the Socotra Archipelago, and Sharaf *et al.*, (2018) recorded 123 ant species from Oman. This indicates a significant gap regarding our knowledge on the ant fauna and their diversity in Qatar. In this study ant specimens were collected by using aspirator, direct hand collection, litter sifting and pitfall traps during the period of April 2015 to March 2019 from different sites around the country. In the present study 44 species are newly recorded for the ant fauna of the state of Qatar. By including the present records, the total number of ant species from Qatar has increased to 51 species, including three additional families, 17 additional genera and 44 new species records from Qatar. This study provides the first taxonomic survey of the ant fauna of Qatar. Future investigations will add more information on family Formicidae fauna of this country. (QU, NHMBE)

**3.5.42 UCE PHYLOGENOMICS REVEALS THE
EVOLUTIONARY HISTORY OF THE ARBOREAL ANT
GENUS *MYRMELACHISTA* (FORMICINAE:
MYRMELACHISTINI)**

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Natural history and phylogenetic data together can be a powerful approach to understanding the evolutionary history of ant-plant associations by disentangling species relationships and clarifying instances of convergently evolved traits. Despite a vast literature dealing with the ecological side of ant-plant interactions, few are the studies where phylogenetic analyses and natural history data were employed to investigate the origin and diversification of those relationships. The exclusively arboreal ant genus *Myrmelachista* (Hymenoptera: Formicidae: Formicinae) is distributed throughout the New World tropics and subtropics, and the genus is one of the few ant genera that provides an adequate ecological repertoire to allow the study of evolutionary transitions in ant-plant symbiotic associations. There are 56 known species and 13 subspecies of *Myrmelachista*, and in this ant lineage, species are known to be either dead-stem inhabitants or live-stem nesters. The live-stem associations involving *Myrmelachista* include generalists ants occupying various plant families or specialized live-stem nesters (=obligatory symbiotic species) inhabiting live stems of a particular species or set of species within a plant genus. The latter include specialist inhabitants of understory Lauraceae and Meliaceae in Central America, and "devil garden" ants inhabiting Melastomataceae in South America. We use a phylogenomic approach (enrichment of ultra-conserved elements [UCEs]) and natural history data to investigate the evolutionary history of a Neotropical lineage of exclusively arboreal ants, genus *Myrmelachista* (Hymenoptera: Formicinae) and their associated plants. We present a UCE phylogeny for 40 species from throughout the range of the genus, covering all the morphological and behavioral variability. The obtained phylogeny was used to investigate the evolution and lability of nesting habits in *Myrmelachista*. We confirm the existence of at least four instances of live stem specialization within the genus, with three separate clades of *Myrmelachista* species convergently occupied similar understory plants. Ancestral state reconstructions suggest that those specialized associations involving a degree of plant-protecting behaviour evolved from generalized live-stem inhabiting ancestors. Those clades are inferred to have arisen in the Late Miocene, independently evolving similar morphological and ecological traits. (Society of Systematic Biologists - Graduate Student Research Award, Linnean Society of London - Systematics Research Fund, Center of Latin American Studies, University of Utah – Field Research Grant.)

3.5.43 CHECK LIST AND NATURAL HISTORY OF THE ANT FAUNA (HYMENOPTERA: FORMICIDAE) OF THE NAHUEL HUAPI NATIONAL PARK (NW PATAGONIA, ARGENTINA)

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The Andean-Patagonian forests, also known as Sub Antarctic forests, spreads over steep elevations along a thin strip on both sides of the Andes, on southern South America. Despite the considerable low diversity of ant species, natural history records are relatively scattered for the ant fauna in the whole Andean-Patagonian region of Argentina, mostly coming from the mid-1950s. We describe the ant fauna of the Andean-Patagonian forests from Argentina, with a main focus on the natural history of the species. The sampling period was carried out between November and December 2018 using a variety of techniques (arboreal pitfall traps, Winkler extractors and manual collections) in the Nahuel Huapi National Park (NHNP), located in the northwest Patagonian region of Argentina. Collections sites were selected from literature sources like Kusnezov and Kushel, and some areas were revisited; it also included a complete survey of the Victoria Island, a natural reserve included in the NHNP. We also surveyed the scientific literature to obtain additional records and/or biological information for ants from the Andean-Patagonian region in Argentina. Seventeen species/morphospecies are recorded for the region, and we report for the first time undescribed castes and expanded the known distribution range for some species. *Lasiophanes atriventris* (Smith, F., 1858) was the most common species found in the NHNP. Natural history repertoires (foraging and activity patterns, nesting preference, interspecific interactions) are described for the first time for several species. Among the new reports are the first case of a South American species of *Solenopsis* tending scale insects within live-stems of a host plant and the potentially pollination role of *Camponotus distiguendus* (Spinola) in radial trees (*Lomatia hirsuta* Diels ex Macbr.). (Center for Latin American Studies – Field Research Award, University of Utah; Fondo para la Investigación Científica y Tecnológica (FONCyT).)

3.5.44 UNRAVELING DIVERSITY PATTERNS AND ENDEMISM IN MALAGASY ANTS: A PHYLOGENOMIC APPROACH

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The first step in preserving biodiversity and its associated ecosystem functions is assessing and quantifying measurable units of this diversity. Two key elements of measuring biodiversity across space and time are species diversity and endemism. In the past, most survey efforts have been focused on using species as the units of diversity and endemism, but over the last decade it has become more common practice to assess phylogenetic diversity alongside species richness. Here we use a phylogenomic approach to investigate regional patterns of community structure across ants in Madagascar, based on a genomic data set of ~2,200 loci of ultraconserved elements for 32 species of *Crematogaster*. We compiled distribution data from approximately 3,038 collection records of 261 well-sample communities, conducting spatial analyses at a 10km² grid, and producing species distribution models with Maxent to correct for sampling bias. We analyzed phylogenetic patterns of diversity and endemism using randomization tests to identify communities with significantly high or low values of phylogenetic diversity (PD). We show that the higher species richness (SR) is found along the eastern and northern humid forests in Madagascar, in contrast to a continuous band of low richness extending across the rest of the country, with the vast majority of Madagascar supporting less than six species of *Crematogaster* per community. In contrast, a similar analysis using the modeled species distribution data suggests a very large portion of the country's central higher-elevation region and the northern and eastern areas of lowland humid forests as centers of diversity for *Crematogaster*. PD patterns are similar to richness for the empirical dataset, showing the communities in the north of Madagascar as the greatest hotspots of PD, with 58-66% of the lineages represented. For the modeled data, the overwhelming pattern shows high PD in northern, eastern and western regions in Madagascar. The highest levels of endemism (WE) and phylogenetic endemism (PE) can be found at higher elevation (above 900m) communities, both for the empirical and modeled data sets. Based on these results, we identify significant hotspots of neo- and paleo-endemism, and test for correlation with climatic and primary productivity gradients across eleven different habitat types. By ultimately expanding these analyses to include other ant taxa, our island-wide community analyses will uncover general patterns of species richness, lineage diversity and endemism across ant communities in Madagascar, allowing us to draw broad, widely applicable conclusions about the importance of these patterns for conservation planning. (NSF, NCSU, CAS)

3.5.45 GHOST IN THE SHELL: NEXT GENERATION PHENOMICS AND 3D CYBERTAXONOMY OF ANTS

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The advent and rise of molecular sequencing and analyses techniques have revolutionized our understanding of evolution. Increasingly, more extensive phylogenomic datasets become available and provide robust reconstructions of all levels of the tree of life. However, the study of phenotypes has remained rather slow and presently suffers from a significant gap of scalability between morphological and genomic data, both in size and acquisition speed. The knowledge of morphological modifications through time is crucial for the reconstruction of complex evolutionary scenarios but such data is scarce and unavailable for most taxa. Recent technological advances have opened new possibilities for interactive and three-dimensional (3D) imagery, of which x-ray microtomography (micro-CT) is the most commonly used. It enables non-invasive, high-resolution, detailed 3D analyses of morphological structures and the digitization of tissues, organs, or whole specimens, but it is also an excellent tool for the virtual examination and dissection of (often rare and valuable) material in order to evaluate and discover new morphological characters of taxonomic or phylogenetic significance. This extraordinary richness of morphological data, as well as novel ways to analyse and present it, open up new possibilities to strengthen the role of morphology within the field of systematics. This talk will give an overview of recent projects employing micro-CT and 3D specimen data for different aspects of systematic and evolutionary biology, and highlight both, opportunities and challenges. We will explore the potential to quickly generate large morphological datasets that can be analysed within an evolutionary or systematic context. 3D surface models are an excellent data source for 3D geometric morphometrics or other quantitative analyses, especially if embedded within molecular phylogenomic frameworks. Such combination of different lines of data will improve our understandings of how ant shape has evolved through time and explore the drivers and consequences of that evolutionary change. Based on examples of current taxonomic works on different genera, such as *Discothyrea* Roger, *Terataner* Forel, and *Zasphinctus* Wheeler, we will also show the potential of 3D specimen data to greatly advance collections-based research in general and taxonomy in particular through new virtual and interactive possibilities of presenting and publishing morphological data. Overall, 3D modelling offers great potential for a future of natural history museums that combines digitization of collections, usage of collections as biodiversity libraries, and creation of virtual and openly accessible 3D natural history collections.

3.5.46 TOO BIG TO MISS IT: DISCOVERY OF A LARGE UNDESCRIBED *ODONTOMACHUS* SPECIES FROM ECUADOR

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New discoveries of large conspicuous ant species are nowadays rather uncommon. To our surprise, we encountered a conspicuous undescribed trap-jaw ant of the genus *Odontomachus* in the Río Canandé Reserve in NW Ecuador. The reserve belongs to the Chocó region, a place with incredible biodiversity and many endemic species. However, this threatened biodiversity hotspot has received little scientific attention and especially its ant fauna is poorly studied. During our ant survey of this region we discovered the new species and are currently preparing the species description. Together with e.g. *O. mormo* and *O. chelifer*, it is among the largest *Odontomachus* species of South America, and it can be easily recognized even in field by its size and distinct red coloration. We collected alate and dealate queens and workers. Males were not found. We detected several colonies, all located in the arboreal zones. For one colony, we provide information on the nest architecture and behavior in captivity. Morphological as well as genetic evidence suggest that *Odontomachus hastatus* might be the closest relative of the new species. Of great interest to taxonomic researchers is that we used the newly developed Darmstadt Insect Scanner 3D (DISC3D) for the first time in a species description to provide 3D scans with real photographic textures of the holotype and several paratypes. We argue that it provides many benefits for taxonomic work and discuss its usefulness for taxonomic researchers.