



AMAZON BIODIVERSITY CENTER
REPORT ON LOVEJOY CONSERVATION BIOLOGY
RESEARCH FELLOWS
JUNE 2017

Introduction

With financial support from the Sacharuna Foundation, the Amazon Biodiversity Center, a project of the Amazon Conservation Association, awards fellowships to graduate students in the execution of fieldwork related to their MSc or PhD theses at the field units of our Biological Dynamics of Forest Fragmentation Project in Manaus, Amazonas, Brazil. Fellows conduct conservation research on the impacts of forest fragmentation or forest regeneration on plants, animals, ecological processes, and carbon sequestration. Fellows also receive conservation training that empowers them to make informed policy decisions that preserve forests and wildlife as future wildlife conservation managers and policy makers in the Amazon and worldwide.

2017 marks the third year of the fellowship program. To date, four fellows have completed their projects. Thirteen fellows have projects in progress.

Also, in 2017, we are changing the application/award process for fellowships to better sync with the student academic calendar. We awarded seven fellowships in the first round for 2017 this May, and will conduct another request-for-applications process in September.

In November 2016, Dr. Lovejoy had an opportunity to meet with eight of the fellows during a trip to Manaus. Both Dr. Lovejoy and the students were inspired by the meeting.

Below are brief profiles of the 24 Lovejoy fellows, including short descriptions of their projects and illustrations. Fellows have provided us with detailed, scientific project reports, which we are happy to share with anyone on request.

About the Amazon Biodiversity Center

Created in 1978, the goal of the Amazon Biodiversity Center/BDFFP is to understand the impacts of rainforest fragmentation on ecosystems and biological diversity through research and training. Located in Central Amazonia about 80 km north of Manaus, Brazil, the BDFFP serves as a classroom for policy makers, international leaders, and other public figures, helping to raise awareness of the wealth of biodiversity the Amazon holds and the need to conserve the rainforest in order to protect ecosystems from the negative impacts of human development. Hundreds of scientists and resource managers from Brazil, throughout Latin America, and worldwide have benefited from these courses and from research training and internships at the BDFFP. The project has been recognized as the most productive field site (in terms of publications and science produced) in the Amazon-Andes region and the most influential tropical field project worldwide.

Fellows concluding fellowship projects	Status	Institution	Page
Francisca Helena Aguiar da Silva	PhD	INPA - Ecology	04
Marielle Natasha Smith	PhD	University of Arizona	06
Paulo Ricardo Rodrigues Piovesan	MPhil	INPA - Botany	08
Raul Vasconcelos Rodrigues	MPhil	INPA - Ecology	10
Fellows with projects in progress	Status	Institution	Page
Danilo Roberti Alves de Almeida	PhD Candidate	USP - ESALQ	12
José Marcelo Pelloso Molina	PhD Candidate	UEL	14
Patrícia de Oliveira Santos	PhD Candidate	UEL	16
Caroline da Cruz Vasconcelos	MPhil Candidate	INPA - Botany	18
Márlon Breno Costa Santos da Graça	PhD Candidate	INPA - Entomology	20
Ricardo Luís Spaniol	PhD Candidate	UFRGS	22
Alci Albiero Júnior	PhD Candidate	USP - ESALQ	24
Marcel Caritá Vaz	PhD Candidate	University of California – Los Angeles	26
Marcelo de Figueiredo Pissurno Motta Pinto	Mphil Candidate	INPA – Forestry Sciences	28
Adriel Michel Sierra	Mphil Candidate	INPA - Botany	30
Mariana Tolentino Bento da Silva	PhD Candidate	INPA - Ecology	32
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Amanda Picelli	Ph	UFAM - Zoology	38
Chloe Debyser	MS	McGill University - Biology	38
Elan Simons Parsons	MS	University of Florida - Ecology and Conservation	39
Giulliana Appel	Ph	INPA – Ecology	39
Itanna Oliveira Fernandes	Ph	INPA – Entomology	40
Jaynna Isacksson	MS	INPA -- Botany	40
Marlus Almeida	Ph	INPA - Entomology	41

Completed Fellowship Projects

Dr. Francisca Helena Aguiar da Silva



Title: Use and Selection of Resources by *Harpia* in Multiple Spatial Scales: Persistence and Vulnerability

Advisor: Dr. Tânia Sanaïotti and Dr. Ana Albernaz

Institution: National Institute for Amazonian Research (INPA)

Program: Ecology

Ph.D. concluded in Nov. 2016

This work quantified the composition and dynamics of the landscape in the surroundings of Harpy Eagle (*Harpia harpyja*) nests located in Brazil, using classified satellite images of land-use-land-cover from 2004 to 2014, the prey consumed in the nest by the species from traces of prey and photos from camera-traps, and the area of use of four individuals tracked by VHF and satellite radio transmitters. This species, even persisting and reproducing in highly fragmented landscapes, such as in the state of Rondônia, is vulnerable due to the reduction of habitat and lack of functional connectivity of the landscape around their nests. This imposes difficulties to juvenile dispersion. These nests are likely to be active and reproducing limited to the lifetime of adults. Recurrent hunting and logging throughout its occurrence is also a source of Harpy Eagle threat, as the individuals tracked by satellite have moved around fragmented areas, being exposed to negative encounters with humans. Awareness campaigns and landscape restoration projects to promote connectivity in the region, known as "the deforestation arc" and Atlantic Forests, should be implemented for Harpy Eagle conservation throughout its territory in Brazil.

Published manuscripts

Aguiar-Silva, F.H., Jaudoin, O., Sanaïotti, T.M., Seixas, G.H.G., Duleba, S., Martins, F.D. 2017. *Camera trapping at active Harpy Eagle nests: interspecies interactions under predation risk. Journal of Raptor Research* 57(1):72-78.

Manuscripts in preparation

- Aguiar-Silva, F.H., Albernaz, A.L.K.M., Sanaïotti, T.M. *Persistence and vulnerability of the Harpy Eagle across fragmented landscapes at Brazilian forests.*
- Aguiar-Silva, F.H., Sanaïotti, T.M., Oliveira-Santos, L.G.R. *Home range of Harpy Eagle in Brazilian Amazonia.*

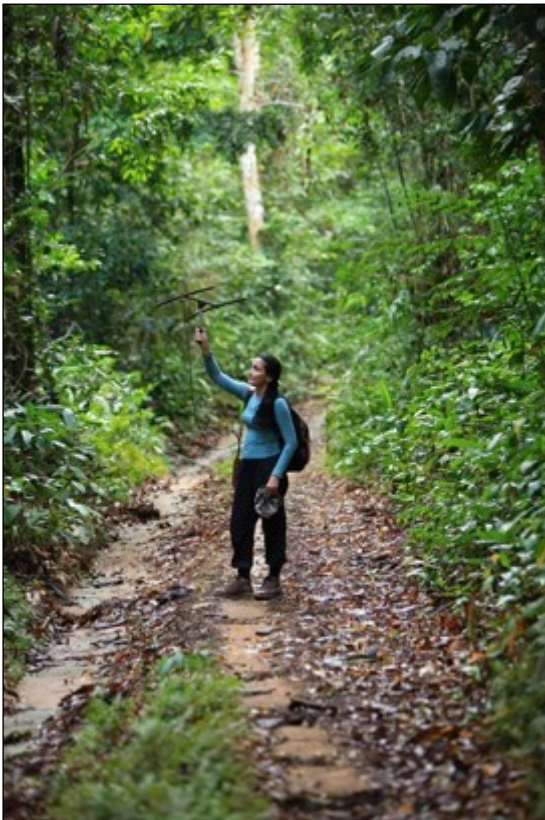
Presentations, lectures, public seminars, etc.

- I Seminário de Pesquisa da Floresta Nacional de Carajás e XIV Seminário Anual de Iniciação Científica da UFRA, 21 a 23 de novembro de 2016, Parauapebas, Pará.

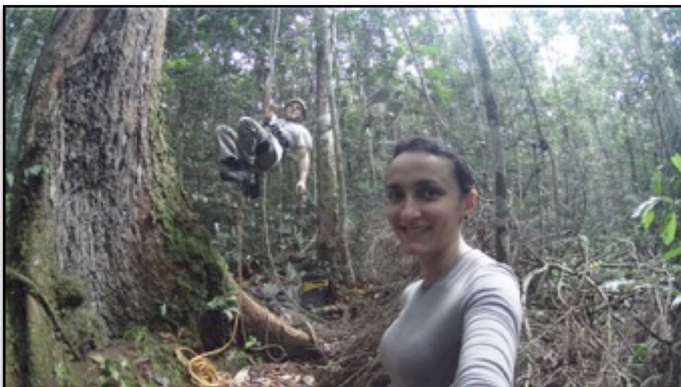
Illustrations



Adult Harpy Eagle with a howler monkey (Alouatta macconnelli) caught and brought to juvenile from nest ZF3 Km41 (June 13th, 2016).



Tracking an adult female Harpy Eagle in Belterra (Pará state), using a VHF system coupled to the satellite transmitter, also installed in three different birds studied during the thesis (Photo: Olivier Jaudoin, November 19th, 2014).



At the base of the Harpy Eagle nest tree (N1 ZF3 Km41), with the tree climber Olivier Jaudoin, which climbs (with ropes and ascending equipment) the nest tree to collect traces of prey in the nest and change the memory card and batteries of camera-trap (2016).

Dr. Marielle Natasha Smith



Title: Quantifying changes in three-dimensional forest canopy structure and light environments during tropical forest regeneration using LIDAR

Advisor: Dr. Scott Saleska

Institution: The University of Arizona

Program: Ecology & Evolutionary Biology

Ph.D. concluded in Dec. 2016

Amazon forests play an important role in global atmospheric circulation, such that changes to these forests could alter water and carbon cycles, as well as energy balance. Land-use change is a major driver of canopy structure and function change in Amazonian forests. Researchers at the Biological Dynamics of Forest Fragments Project (BDFFP, Manaus, Brazil) identified two alternative pathways to forest succession in secondary forest areas. We measured forest canopy structure in *Vismia*- and *Cecropia*-dominated forests using ground-based LiDAR in order to assess whether these different regeneration pathways lead to distinct canopy structures. *Cecropia*-dominated succession followed clearcutting, whereas *Vismia*-dominated stands resulted from abandoned pastures that were burned annually. Such contrasting canopy structures could have consequences for canopy function and potential feedbacks to surface-atmosphere interactions. The findings could be scaled up to make regional-scale predictions of the structural trajectories of secondary forest areas using airborne LiDAR surveys to identify different secondary forest types.

Manuscripts in preparation

Smith, M.N., R.L. Assis, D.R.A. de Almeida, J. Schietti, L. Vieira, N. Emidio, R.C.G. Mesquita, J.L.C. Camargo, S.R. Saleska and S.C. Stark. *Quantifying differences in three-dimensional forest canopy structure in tropical forests regenerating via alternative successional pathways using ground-based LiDAR.*

Illustrations



Marielle and assistant using ground-LIDAR equipment to measure the secondary growth forest structure at BDFFP.

Paulo Ricardo Rodrigues Piovesan, M. Phil.



Title: Lianas of Central Amazon: relation between abundance, propagation and phylogenetic aspects

Advisors: Dr. Isolde Ferraz; **Co-advisors:** Dr. José Luís Camargo & Dr. Robyn Burhnam

Institution: Instituto Nacional de Pesquisas da Amazônia (INPA) / National Institute for Amazonian Research

Program: Botany

M.Phil. concluded in March 2017

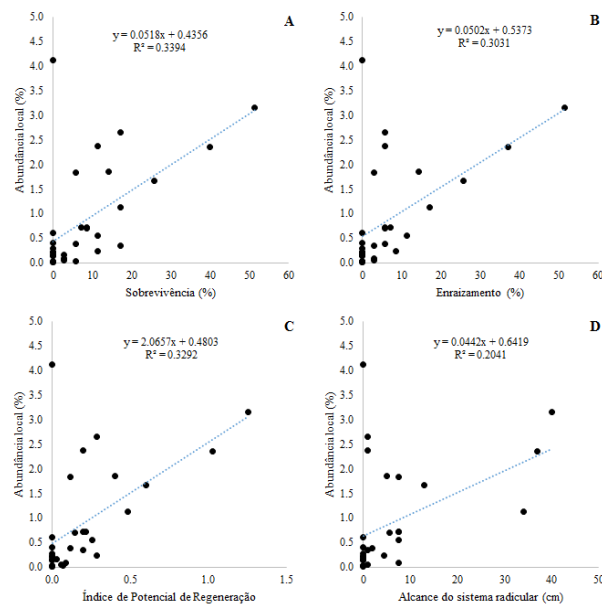
Lianas (vines) are plants that need support to reach the forest canopy. Some authors suggest that the high local abundance of individuals of some species is due to high reproductive capacity through vegetative means. We evaluated whether vegetative propagation capacity of liana species can explain the relative local abundance of the species, and if this vegetative propagation capacity is correlated with the phylogenetic placement of the studied species. We based liana species selection on relative abundance data for lianas in the 25-ha Reserve at KM 37, in the Biological Dynamics of Forest Fragments Project, Manaus, Brazil (data from Robyn J. Burnham). Priority species were those that formed congener pairs with species showing different levels of abundance, and a spectrum of species that represented the local diversity of lianas. Lianas cuttings were planted horizontally in plastic boxes containing a layer of sand covered by a layer of coconut fiber, and maintained in moist conditions for five months in the greenhouse of the National Institute of Amazonian Research, simulating tropical forest conditions. The results indicated a significantly positive correlation between vegetative propagation and local relative abundance (Figure 1). Congeneric species with similar abundances showed similar vegetative propagation capacity (Figure 2). Vegetative reproductive capacity was compared within all major evolutionary lineages including lianas, and was highest in the families Fabaceae and Bignoniaceae (Figure 3), which are the two families of greatest abundance in the studied area and generally in neotropical forests.

Manuscripts in preparation

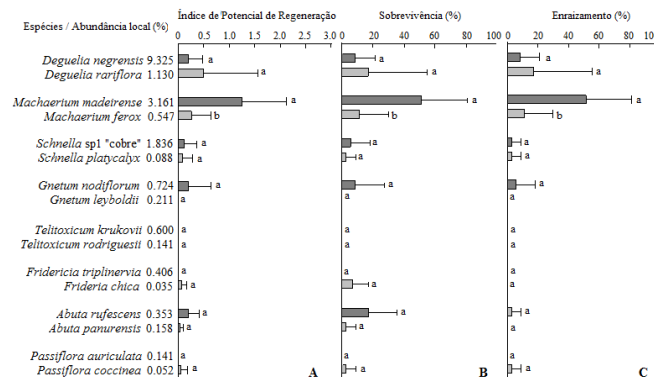
- Lianas of the Central Amazon: the relation between abundance, vegetative propagation and phylogenetics aspects. Piovesan, P.R.R., I.D.K. Ferraz, R.J. Burnham & J.L.C. Camargo.

To be submitted to Forest Ecology and Management.

Illustrations



Pearson correlation ($n = 31$) between local abundance of lianas, expressed as percentage and A) percentage of survival of cuttings after 150 days; B) percentage of rooting of cuttings after 150 days; C) Regeneration Potential Index - IPR; D) reach of the root system (cm). Dotted line represents the linear regression line.



Comparison within the pairs of the variables of vegetative propagation capacity. A) Regeneration Potential Index; B) survival of stakes after 150 days of planting; C) rooting of stakes after 150 days of planting. Columns represent the mean of the variables and bars the default error. Different letters for each pair show a significant difference between the values, calculated by the Mann-Whitney test ($\alpha = 0.05$).



Formation of the aerial part of stakes placed in the horizontal position and in substrate like coconut fiber. A) beginning of aerial part formation, with emphasis on the substrate used; B) shoot development. (*Machaerium madeirense* - Fabaceae).

Raul Vasconcelos Rodrigues, M. Phil.



Title: Permissible matrix and forest fragments: lizard assemblages in Central Amazonia as a study model

Advisor: Dr. José Luís Camargo

Co-adviser: Dra. Albertina Lima

Institution: Instituto Nacional de Pesquisas da Amazônia (INPA) / National Institute for Amazonian Research

Program: Ecology

M.Phil. concluded in March 2017

My work shows what effect a fragmented forest environment has on lizards in Central Amazonia. For this, we sampled four treatments: fragments of different sizes (one hectare and 10 hectare), the areas around these fragments (matrices that were composed of secondary forests) and also the areas of continuous forests, which have the species that we can find in the region, because they are the natural environment. We have seen that there are no differences in the species that exist in the treatments, but there are differences in how these species are distributed in the environment, for example *Gonatodes humeralis* is more common in fragments of one hectare than in other treatments. We have also seen that the matrices have similar species to the other treatments, being able to serve as a link between the treatments and reducing the effects of forest fragmentation.

Manuscripts in preparation

Permissible matrix and recolonization of forest fragments: lizard assemblages in Central Amazonia as a study model. Rodrigues, R. V., A.P. Lima, E. V. de Farias & J. L. C. Camargo.



Some of the lizards observed in the field: A. *Copeoglossum nigropunctatum*; B. *Kentropyx calcarata*; C. *Norops fuscoauratus*; D. *Norops ortonii*.

#	Espécies	Familia	Número total de indivíduos				Abundância iva (%)	
			Fragmento 1	Fragmento 10	Floresta ira	Matriz	Total	
1	<i>Gonatodes humeralis</i>	Sphaerodactylidae	100	47	52	34	33	38.0
2	<i>Chotogekko amazonicus</i>	Sphaerodactylidae	38	24	21	54	137	22.3
3	<i>Kentropyx calcarata</i>	Telidae	18	43	22	13	96	15.7
4	<i>Norops fuscoauratus</i>	Dactyloidae	10	5	7	15	37	6.0
5	<i>Copeoglossum nigropunctatum</i>	Scincidae	2	10	6	12	0	4.9
6	<i>Ameiva ameiva</i>	Telidae	2	15	6	6	29	4.7
7	<i>Plica plica</i>	Tropiduridae	5	3	4	2	14	2.3
8	<i>Laxopholis percarinatum</i>	Gymnophthalmidae	4	3	2	4	13	2.1
9	<i>Dactyloa punctata</i>	Dactyloidae	2	2	5	1	10	1.6
10	<i>Tretioscincus agilis</i>	Gymnophthalmidae	2	1	2	0	5	0.8
11	<i>Norops ortonii</i>	Dactyloidae	2	0	1	1	4	0.7
12	<i>Plica umbra</i>	Tropiduridae	0	1	1	1	3	0.5
13	<i>Norops chrysalepis</i>	Dactyloidae	0	0	0	2	2	0.4
-	TOTAL	-	185	154	129	145	613	100

List of species, and total number of lizard individuals recorded in four distinct ARIE BDFFP environments, 80 km north of Manaus - Central Amazonia.

Fellowship Projects in Progress

Danilo Roberti Alves de Almeida, Ph.D. candidate



Project: Is it possible to predict diversity considering forest structure? Mapping structural differences and their relationship with the floristic diversity from LiDAR data

Advisor: Dr. Luiz Carlos Estraviz Rodriguez

Institution: Universidade de São Paulo – Escola de Agricultura (ESALQ – USP) / University of São Paulo – College of Agriculture

Program: Forest Sciences

The g-LiDAR data were collected in the field in July 2015 in the sites of Dimona (forest fragment of 100 hectares) and Florestal (continuous forest in the reserve of 100 hectares). Subsequently, the modeling analyzes with the ground-LiDAR data were performed to estimate the vegetation profiles of the sites (Figure 1). Currently the Airborne LiDAR data (ALS - Airbone Laser Scanner) is being processed for further analysis and production of the doctoral and chapter and paper.

Manuscripts in preparation

Recently an expanded abstract entitled "Land LiDAR for edge effects and fragmentation on structural attributes of the canopy in Central Amazonia" was submitted and accepted for oral presentation, with some previous results for the Brazilian Symposium on Remote Sensing 2017 that will take place in the city of Santos, São Paulo State, in May 28th to 31th, 2017. (Study 711 of the Technical Series of the BDFFP).

Presentations and lectures

- Almeida, D.R.A., P.H.S. Brancalion, J.S. de Almeida, E.B. Görgens, B.W. Nelson, S.C. Stark, D.M. Rosa, A.P. Lopes, N. Amazonas, T.R. de Souza, R.L. de Assis e J.L.C. Camargo. *LIDAR terrestre para investigação de efeitos de borda e fragmentação florestal em atributos estruturais do dossel na Amazônia Central*. Simpósio Brasileiro de Sensoriamento Remoto (SBSR) 2017.

Illustrations



Operating the ground-Lidar equipment in the forests of the BDFFP.

José Marcelo Pelloso Molina, Ph.D. candidate



Project: Pollination of Castilleae (Moraceae) for insects of the order Thysanoptera: a possible cospeciation process?

Advisor: Dr. José Eduardo Lahoz da Silva Ribeiro

Institution: State University of Londrina (UEL)

Program: Biological Sciences

My study seeks to understand the phylogenetic relationships and the diversification of the reproductive systems of Dorstenieae, (tribe of the family Moraceae). For this, we perform the evolutionary reconstruction of the species based on DNA with the morphological analysis of the reproductive traits and observations of the reproduction system in the natural environment.

When do you anticipate finishing your degree?

My doctoral defense is planned for the beginning of 2019.



Controlled crosses being performed in B. gaudichaudii



Inflorescences of B. gaudichaudii with flowers staminate in anthesis.



Tripes morphospecies (Thysanoptera) observed using the inflorescences of B. gaudichaudii as a development site.

Patrícia de Oliveira Santos, Ph.D. candidate



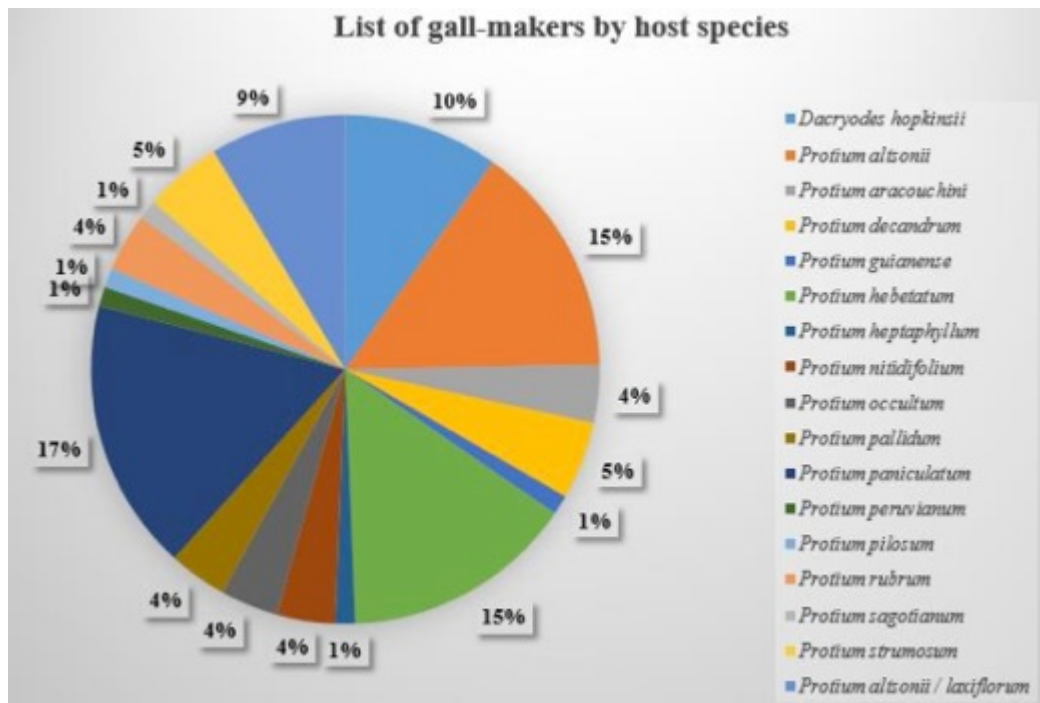
Project: Phylogenetic analysis of Burseraceae and Cecidomyiidae: evidence of coevolution?

Advisor: Dr. José Eduardo Lahoz da Silva Ribeiro

Institution: State University of Londrina (UEL)

Program: Biological Sciences

Many people do not imagine that plants can also have tumors. These tumors are known as galls and can be caused by mainly insects. In the case of insects, they lay their eggs in the plant, inducing the formation of tumors, which end up serving as food for the larva that is later born as an adult insect, and the cycle starts again. This study on insect galls has focused on knowing the diversity of galls induced by different species of insects in different plant species. For this, it has been considered that each species of insect induces gall in a particular species of plant, which some researchers call maximum specificity. It has been considered that this interaction is very specialized and therefore, the discussion has been raised on whether these species are evolving together, what is called coevolution. To find evidence of coevolution, it is necessary to study two groups that are closely related. Thus, plants of the Burseraceae family and the family of galling insects Cecidomyiidae have been chosen, precisely because it is known that, between these two groups, the occurrence and diversity of galls is very high. Therefore, the objective of this study is to investigate the interaction between these plants and galling insects, thus contributing to a better understanding of this relationship from an evolutionary point of view.



List of gall-makers by host species of Burseraceae sampled in fragments of the Biological Dynamics of Forest Fragments Project (PDBFF) - National Institute of Amazonian Research (INPA), Manaus - Amazonas - Brazil, between August and October 2016.



Figure 5. Several gall-makers larvae in a single chamber - *Protium pallidum* (Burseraceae).

Caroline da Cruz Vasconcelos, M. Phil. Science candidate



Project: Propagules and seedlings of Sapotaceae-Chrysophylloideae in the Amazon: a phylogenetic approach

Advisor: Dr. Isolde Ferraz

Co-advisors: Dr. Mario Terra & Dr. José Luís C. Camargo

Institution: Instituto Nacional de Pesquisas da Amazônia (INPA) / National Institute for Amazonian Research

Program: Botany

Sapotaceae is a botanical family of great importance from an ecological and economic point of view. Their trees are valuable components in tropical forests and their products like wood, latex, and fruits are widely used. The taxonomy of the family is not simple, and is often difficult to interpret. Complementary approaches, such as molecular character analysis, are needed for a more accurate delimitation. In this context, this project seeks to increase the morphological knowledge of fruits, seeds and seedlings of the neotropical genera of the subfamily Chrysophylloideae and add, if necessary, molecular characters that can aid in the generic delimitation of Sapotaceae. The project has an evolutionary approach to understand the phylogenetic and morphological relationships among the members of the study group. A by-product of this project will be an illustrated guide to assist in the identification of trees, fruits, and seedlings, and an interactive multi-access identification key.

Illustrations



Studying botanical collections in the INPA seed and nursery laboratory. A and B: biometric measurement of fruits and seeds. C: fruit processing. D: processing and drying of the botanical samples. E: morphological description of fruits and seeds with the aid of a stereomicroscope. F: variation in shape, size.

Márlon Breno Costa Santos da Graça, Ph.D. candidate



Project: Taxonomic composition, functional and phylogenetic, of frugivorous butterflies in three reserves of the BDFFP

Advisor: Dr. Elizabeth Franklin Chilson

Institution: Instituto Nacional de Pesquisas da Amazônia (INPA) / National Institute for Amazonian Research

Program: Entomology

Butterflies are charismatic insects that have a recognized ability to indicate anthropogenic environmental disturbance. Destruction of forests due to habitat fragmentation, for example, has severe impacts on these insects. Many species are locally extinct because they do not adapt to new environmental conditions. For example, a butterfly species will not be able to feed its larvae if the plant from which it feeds is extirpated from the forest. Thus, the species in question, in order to not perish, will have to migrate to other areas. However, forest fragmentation also destroys migratory paths, thereby cornering butterflies that are more susceptible to abrupt changes. In this context, the objective of this study is to evaluate how butterflies -- bioindicators of habitat quality -- are responding to anthropogenic changes in the environment. Studies like this are indispensable for the elaboration of policies that aim at the management, as well as the conservation, of natural environments.



Figure 1. Bait traps installed in the understory (left) and canopy (right).



Male of *Opsiphanes invirae* caught in the bait trap (left).



Archaeoprepona demophoon (left) and *Historis acheronta* (right) collected in the BDFFP ARIE.

Ricardo Luís Spaniol, Ph.D. candidate



Project: Functional organization of frugivorous butterfly guilds in a forest disturbance gradient in Central Amazon

Advisor: Dr. Milton de Souza Mendonça Jr.

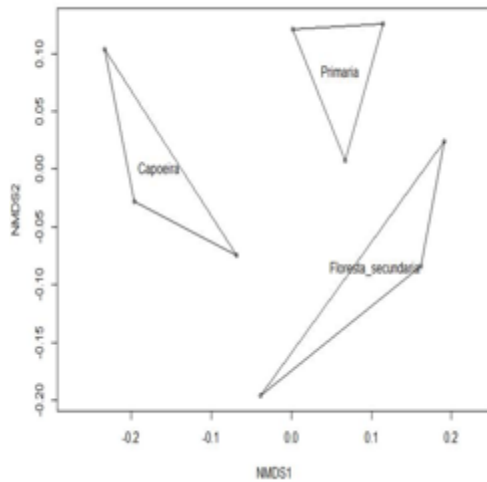
Institution: Universidade Federal do Rio Grande do Sul (UFRGS) / Federal University of Rio Grande do Sul

Program: Ecology

We study the organization of fruit-eating butterfly communities in environments with different stages of forest succession. For this we evaluated three components of biological diversity in butterflies: the number of species and their composition; morphology (measures of size) and behavioral (colors, anti-predatory strategies); and phylogenetic. We realized at first that the number of species does not seem to change as forests advance in succession, but the composition does. The degree of relationship between these species does not seem to be acting on the occurrence or preference for an environment, not even measures of size or color they present in different places. However, the characteristics of the butterflies become more diversified towards primary forest environments, which suggests that the species manifest different adaptation strategies in relation to the interactions with the environment and with the other competing organisms, predators or mutualists present. At this point we are extending the evaluation of this succession gradient including the study of forest fragments, and thoroughly analyzing the main strategies of butterflies in response to changes in the environment.

Presented studies at symposia, participation in courses, Lectures and public seminars, Others

- *Seminar at the Ecology post-graduation program to present findings and current state of the project – May 18th 2016;*
- *V Brazilian Symposium on Theoretical Ecology – Gramado, Rio Grande do Sul: “Seleting functional traits of lepidoptera with emphasis on the study of fragmented landscapes” – October 16th to 18th 2016.*



Frugivorous butterflies' species composition (NMDS ordination) in fallow habitats, secondary forest and continuous forest in Biological Dynamics of Forest Fragments Project study areas.



Trap revision in second growth forest at BDFFP areas.



Butterflies and moths sampled from BDFFP's fragments mounted and deposited in entomological boxes.

Alci Albiero Junior, Ph.D. candidate



Project: Dendrochronology applied in the assessment of edge effect in forest fragments in the Brazilian Amazon: growth rate and mortality of trees by the analysis of growth rings

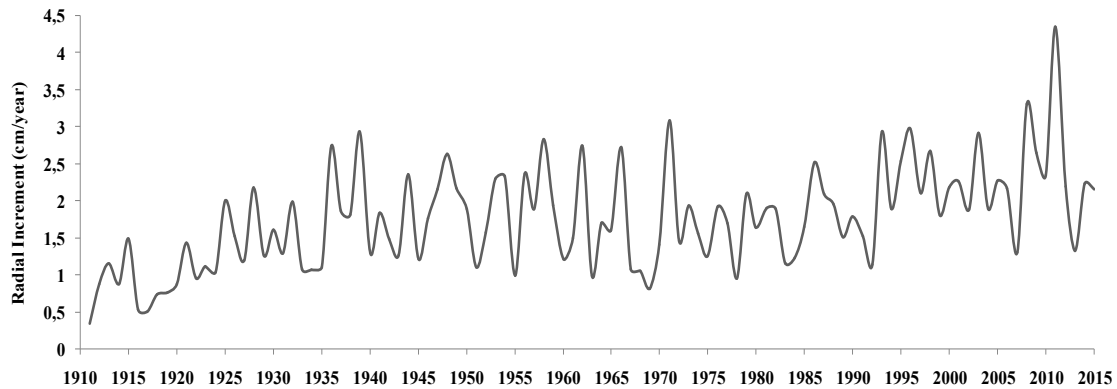
Advisor: Dr. Mario Tomazello Filho

Institution: Universidade de São Paulo – Escola de Agricultura (ESALQ – USP) / University of São Paulo – College of Agriculture (ESALQ – USP)

Program: Applied Ecology

Every forest environment has areas of great contact with the external environment, which we call edge effects areas. Because they are at the distribution limit of the forest and receive direct peripheral influences that alter the microclimate, species composition, carbon stock and tree mortality, they are considered key areas in determining the quality of the entire habitat. The reduction of forests and their fragmentation promote an increase of areas on edge effect, and despite being considered the largest tropical forest in the world, the Amazon forest is largely affected by these effects. Thus, through a Dendrochronological perspective, analyzing growth rings, our research seeks to reveal how edge effects due to the isolation and fragmentation of areas of the Biological Dynamics of Forest Fragments Project, are changing the dynamics of growth, carbon accumulation, and tree mortality during their life cycles.

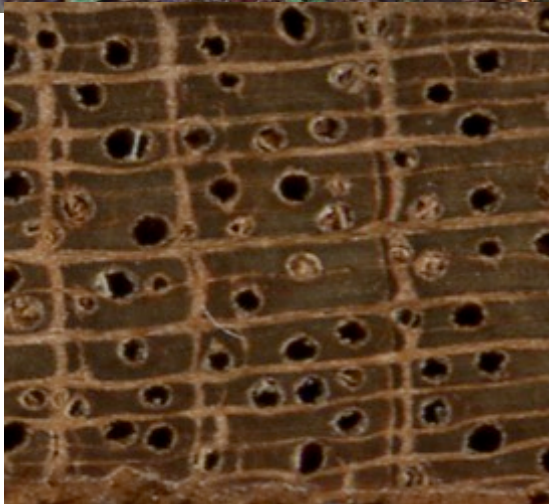
Illustrations



*Mean annual radial increment of Scleronema micranthum individuals located at the edge.
Fazenda Porto Alegre - Reserva 3304.*



*Non-destructive sample collection of
the radial section of wood of
Scleronema micranthum in edge area
at Fazenda Porto Alegre - Reserva
3304.*



*Transversal section of Scleronema micranthum wood
revealing the annual growth rings delimited by distended
tangential rays, touching bands of apotracheal
parenchyma (100x amplification).*

Marcel Caritá Vaz, Ph.D. candidate



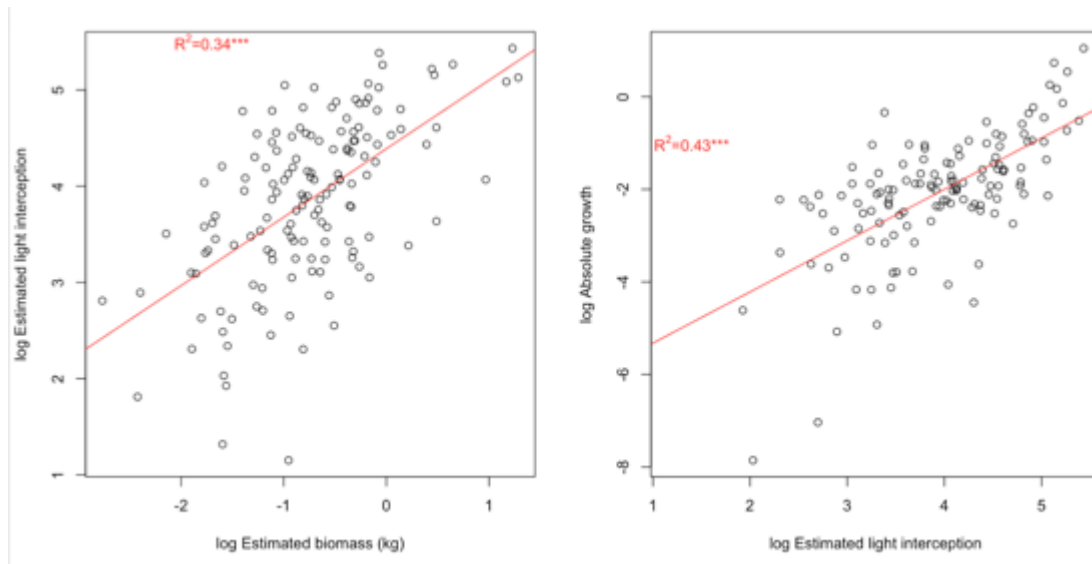
Project: Do trade-offs in interception efficiency and use efficiency reduce size-asymmetric competition for light? A test with saplings in the understory of a Central Amazon forest.

Advisor: Dr. Nathan Kraft

Institution: Universidade da California, Los Angeles
/ University of California, Los Angeles (UCLA)

Program: Ecology and Evolutionary Biology

In their struggle for existence, plants compete for resources such as water, nutrients, and light, which is probably the most limiting resource in humid tropical forests. Competition for light, a unidirectional resource, is heavily driven by size; the tallest plants intercept most of it, leaving the shortest ones in their shadow. On the other hand, tall plants have to incur into heavy costs to maintain their size, while short plants have a much lower cost to do the same. In the end, because of this correlation between size and maintenance costs, the profit margin of tall trees may not be very different from that of small trees. If this is true, it would explain why in the same forest we can find plants as short as a few centimeters and giant trees more than 100m tall.



Relationship between biomass (estimated from tree diameter and wood density) and the amount of light intercepted by trees from a given species (left) and between light intercepted and absolute growth (right).



Finding the right tree proves to be a challenge sometimes (especially when the trees we are looking have died or lost their tag), but once it is found we measure its height and crown dimensions with the help of a laser distance measurer, along with several other observations, such as the above and below crown light incidence, the conditions of the forest canopy above the sampled tree, and its general branching pattern.

Marcelo de Figueiredo Pissurno Motta Pinto, M.Phil. candidate



Project: The importance of biotic factors in the establishment of propagules in secondary forest in Central Amazon

Advisor: Dra. Rita de Cássia Guimarães Mesquita

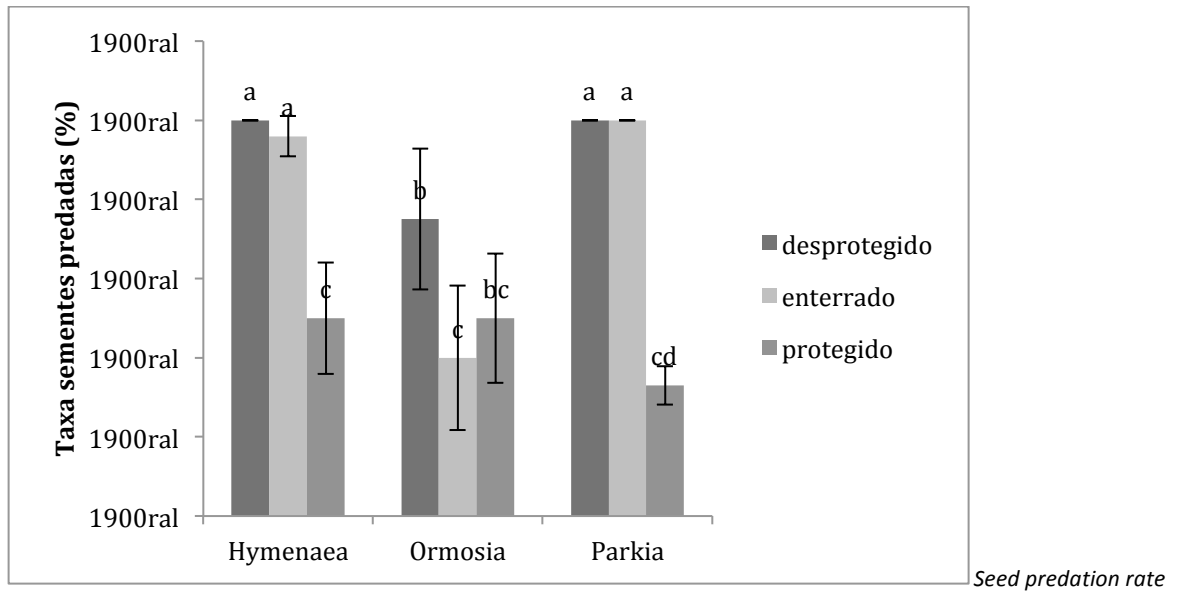
Institution: Instituto Nacional de Pesquisas das Amazônia / National Institute of Amazonian Research (INPA)

Program: Forest Sciences

In the 1970s and 1980s, government incentives drove the clearing of rainforest land to conduct livestock and agriculture operations in the Amazon region. After a few years these farms were abandoned because they quickly became unproductive. Pasture land began to resume ecosystem succession, but few types of trees grew there, for example the Lacre (*Vismia* sp.). The pasture became a second growth forest – colloquially called “capoeira” – with small trees.

Why doesn't abandoned pasture that was previously a forest not return to the original state of a forest, instead forming a capoeira with smaller number of species, and with smaller structure of trees and plants? Even with mature forest nearby, why there are no species of this forest inside the “capoeira”? We have many questions that follow from this line of thought.

In response, a field experiment was set up to simulate how the seeds and seedlings of forest species would behave in a “capoeira” area abandoned for 20 years on the BDFFP reserve. Seed and seedlings of three forest species were placed under different positions, and mesh was used to protect them against predatory animals. We seek to understand how these animals interfere in the regeneration of an anthropic area.



Left: Installation of the seedlings experiment; Right: seedlings protected by mesh.



Seeds protected by mosquito mesh.

Adriel Michel Sierra, M.Phil. candidate



Project: A ten-year comparison of epiphyll community structures in fragmented and continuous forest

Advisor: Dr. Charles Eugene Zartman

Institution: Instituto Nacional de Pesquisas das Amazônia / National Institute of Amazonian Research (INPA)

Program: Botany

Bryophytes are unique among land plants in that the gametophyte stage is the dominant stage with demonstrably high colonization/extinction rates, and high sensitivities to local environmental conditions. Past research in the BDFFP broadly evaluated the impacts of fragmentation on the community structure, population demography, and genetic structure of epiphyllous bryophyte. However, after the last bryophyte survey, secondary forests have regrowth around the forest fragments diminishing the impacts of fragmentation leading to recolonization of various organisms. We are evaluating temporal changes in the epiphyll community structure in fragmented forest comparing to past data, and evaluating the spatial distribution considering life history traits. Our results will give an insight on the impact of fragmentation on a highly dynamic and taxonomically diverse plant community, leading to new conservation implementations and strategies, considering this group of plants in vanishing tropical forest.



Pressing leaves with epiphylls collected from the inventory plots



Leaf completely covered with various species of epiphylls collected in continuous forest (reserve Km 41).

Mariana Tolentino Bento da Silva, Ph.D. candidate



Project: Social and spatial determinants of reproductive success of white-throated-tangara (*Corapipo gutturalis*, Aves: Pipridae) in Central Amazonia

Advisor: Dr. Marina Anciães

Institution: Instituto Nacional de Pesquisas das Amazônia / National Institute of Amazonian Research (INPA)

Program: Ecology

Manakins are Neotropical birds with a lek mating system. Leks are aggregations of males who exhibit to attract females. My Ph.D. project proposes to understand which behavioral, spatial, and social elements are involved in the mating process to obtain a greater reproductive success of the individuals for the species *Corapipo gutturalis* (white-throated manakin): Which males have greater reproductive success? What do males do to attract females? What display elements attract more females? How do females choose males? Understanding how these interactions between individuals work, we can infer in environmental, evolutionary, and ecological conditions for the maintenance of this system and thus the species

Illustrations



Adult male.



Left: Young male recaptured; Right: young male.



Installing a camera trap.

Elisa Queiroz Garcia, Ph.D. candidate



Project: Land-use impacts on the reproductive biology of a species of electric fish (Gymnotiformes)

Advisor: Dr. Jansen Zuanon

Institution: Instituto Nacional de Pesquisas das Amazônia / National Institute of Amazonian Research (INPA)

Program: Ecology

We seek to understand if the reproduction of a species of a small electric fish (sarapó) is affected in streams (colloquially known as igarapés) with different degrees of deforestation. To do so, we sampled igarapés located in areas with different degrees of deforestation, evaluating the reproductive condition of the fish in the streams where the species was detected. In addition, we recorded information on the physicochemical properties of the water from these streams.



Detail of the method of detection of electric fishes. We use an electric cable with an electrode at its distal end that is connected to an amplifier. The device captures the electrical signal produced by the fish and transform it into audible sound. The sound varies from species to species and allows the precise localization of the electric fish in its environment.



Preparation for insertion of electronic tag (pit tag; arrow) through a special syringe. The mark allows the individual identification of the fish and the detection of their position in the environment. The fish was previously anesthetized with Eugenol solution for the insertion of the tag.

Fátima Carolina Recalde Ruiz, Ph.D. candidate



Project: Top-down and bottom-up effects in riparian food webs mediated by allochthonous emergence of aquatic insects

Advisor: Dr. Gustavo Quevedo Romero

Institution: State University of Campinas

Program: Ecology

The objective of the study is to investigate the role of the alien resources in the host communities. Emerging aquatic insects from streams act as a resource for predators such as spiders. We consider this study important for the conservation of forests, since we hope to demonstrate that such resources reach distances far from water sources. Thus, the trophic structure and the isotopic niches of the terrestrial community are affected. Currently, the New Brazilian Forest Code stipulates the conservation of only 30 m of ciliary forest (*i.e.*, riparian buffer zone) for narrow watercourses. We hope that this work will contribute to the dissemination of the importance of water courses in the functioning of forests, consequently causing a reassessment of the environmental law for greater conservation of forests. This study would also help in environmental education efforts in society, reinforcing evidence that ecosystems are interdependent and that the destruction of an ecosystem (*e.g.*, a stream) will affect the surrounding forest.



*Spider (Family Araneidea) from
Cabo Frio reserve.*



"Vinegaroon" (Order Uropygi) from Reserve KM 41.



Team in the field.

Spring 2017 Lovejoy Conservation Biology Fellows

Amanda Maria Picelli, Ph.D. candidate



Project: Effect of landscape on the prevalence and parasitemia of hemoparasites (Apicomplexa: Coccidia) on Amazonian lizards (Squamata: Teiidae)

Advisor: Dr. Igor Kaefer

Institution: Amazonas Federal University

Program: Zoology

Chloé Debyser, MPhil. candidate



Project: Tree community composition, functional diversity, and ecosystem functioning in a fragmented forest of the Brazilian Amazon

Advisor: Dr. Andrew Gonzalez

Institution: McGill University

Program: Biology

Elan Simons Parsons, M.Phil. candidate



Project: Shifted in environmental conditions in Amazonian forest fragments: Revisiting a fundamental assumption of tropical conservation biology with infrared photography

Advisor: Dr. Emilio Bruna

Institution: University of Florida

Program: Wildlife Ecology and Conservation

Giulliana Appel, Ph.D. candidate



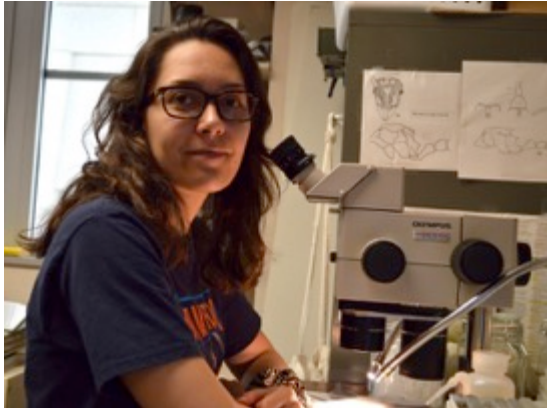
Project: Temporal activity of aerial insectivorous bats in response to lunar luminosity, climatic conditions and prey-predator interaction in fragmented environments in Central Amazonia

Advisor: Dr. Paulo E. D. Bobrowiec

Institution: National Institute for Amazonian Research

Program: Ecology

Itanna Oliveira Fernandes, Ph.D. candidate



Project: "Ants of Mars": *Martialis heureka*
Rabeling & Verhaagh, 2008 (Hymenoptera:
Formicidae: Martialinae) a relictual species

Advisor: Dr. Marcio Luiz de Oliveira

Institution: National Institute for Amazonian
Research

Program: Entomology

Jaynna Isacksson, M.MPhil. candidate



Project: Phylogenetic analysis of neotropical
species of Chrysobalanaceae based on
morphoanatomic characters of fruits, seeds and
seedlings

Advisor: Dr. Isolde Ferraz

Institution: National Institute for Amazonian
Research (INPA)

Program: Botany

Marlus Almeida, Ph.D. candidate



Project: Ecological and spatial scales in the distribution of the Amazon diversity of micro-tarantulas

Advisor: Dr. José Wellington Morais

Institution: National Institute for Amazonian Research (INPA)

Program: Entomology