

The Rufford Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course, but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details

Your name	Rodrigo de Macêdo Mello
Project title	Landscape structure shaping multi-trophic interactions among plants, bats and ectoparasites in a fragmented tropical forest mosaic
RSG reference	24579-1
Reporting period	April 2018 to July 2019
Amount of grant	£4965
Your email address	rodrigomjf@yahoo.com.br
Date of this report	10th August 2019

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Acquisition of biological data of bats and field work				
Classification of landscape data by means of mapping				
Vegetal material collected for seed identification				We are waiting for the process of registering the plant material at the UFLA herbarium and sending the duplicates for precise species identification by taxonomists
Analysis of interactions among plants, bats, and ectoparasites				We are finishing a first scientific paper focusing on how landscape composition and structure shape ecological interaction networks.
Speech about the study in local public elementary				This part of project is a preview to begin early 2020 and it depends on permission of the schools' director for this activity.
Publication of results in scientific meetings and journals, and elaboration of PhD Dissertation				PhD thesis is being elaborated and it will encompass two chapters that will be written in scientific publication style. The first version of chapter 1 is almost finished and it will be submitted to be published in 2019. Chapter 2 is due to be finished late 2020. We will communicate part of results in the 10 ^o Mammal Brazilian Meeting in September 2019.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

The main difficulty along the project was to get authorisation for access in some private proprieties for sampling bats. Part of sampling sites was in areas of nature conservation and these cases the sampling was very well conducted, but we desired to have two additional sites (increasing from 10 to 12 sites), but we did not obtain permission anywhere. Then, we sampled 10 sites, instead of 12 as initially proposed in the approved project. Other difficulties are inherent to the fieldwork, as

extend the time of work (days) due to the heavy rain in the wet season and poorly maintained conditions of some dirt roads.

3. Briefly describe the three most important outcomes of your project.

We consider our initial results very positive, concerning bats, 793 catches belonging to 22 species and three families were recorded. The most abundant family was Phyllostomidae (N = 780), followed by Vespertilionidae (N = 12) and Molossidae (N = 1). Regarding the diet, 11 species of bats presented the fruit consumption of 32 species or morphospecies of plants distributed in eight genera and eight families. Regarding ectoparasites, a total of 1319 individuals were collected from the families of bat fly Streblidae (N = 790) and Nycteribiidae (N = 5), as well Polychtenidae (N = 1) and mites (N = 523). We did fieldwork to collect fruit plants to compare with the seeds found in the bat faeces. Thus, we collected material of 58 plant species (or morphospecies), but these plants are not yet fully integrated into the UFLA herbarium plant collection, and most have not been identified yet. The next step will be to send duplicates to taxonomists in each plant family.

Although part of the analyses is in an incipient stage, we have observed that the interaction networks between bats and plants, and bats and ectoparasites are distinctly affected by the landscape characteristics and structure. In an empirical fashion, we have observed that antagonistic and mutualistic interaction networks may be shaped by a different factor at the landscape level. These results are promising and open new possibilities for ecological studies in the larger scales.

Considering that the area of study presents a highly fragmented landscape with few forest cover and high impact of agribusiness, we assumed that the results were very important. This statement is based on the knowledge that the many phytophagous bat species play important ecological roles and the persistence of some nuclear bat species at the networks benefit the forest fragments maintenance, even in areas so modified and under high anthropic pressures. The bat can play both roles in keeping the forest as well create new forest paths and corridors through seed dispersion, particularly of pioneer's plant species.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

During the fieldwork some local people and institutions were involved with the project. The main institution and person who worked together, there was the RPPN Fazenda Lagoa, local were the team was housed and got many facilities. In that RPPN and others in the region, we had contact with several professionals related with conservation practices and education, and we have contributed with the work and the image that those institutions play for society and nature conservation. Besides and as important as was the contact with managers and workers of the private farms were some sampling sites were placed. This personal contact was important because we had the opportunity to explain about the study and the importance of the bats and the preservation of the forest remnants.

5. Are there any plans to continue this work?

This project is part of my PhD dissertation thus, the project finalises in that moment when I finalise the process. We consider that the study was successfully carried out and the results are promising. However, the lab of my advisor has a team working in southern Minas Gerais with other huge projects with landscape ecology, use of space by bats using radio telemetry in a karstic region very rich in caves, and functional traits in bats. They certainly will continue with this promising area of bat ecology and conservation studies, and The Rufford Foundation grants will always be very important in this matter.

6. How do you plan to share the results of your work with others?

The results will be shared in several ways.

- Master thesis and PhD Dissertation – Two products are being developed. A dissertation was finished in early 2019 by Lilith Silva and focused on diet diversity in frugivore bats and the vegetational heterogeneity (available in <http://repositorio.ufla.br/bitstream/1/35011/1/DISSERTA%20da%20dieta%20de%20morcegos%20frug%20e%20a%20heterogeneidade%20da%20vegeta%20a7%20a3o.pdf>). The PhD dissertation is being carried out for me and it preview to finished in early 2020.
- Scientific meeting – we are expecting that the data will be presented in several meetings. The logo was used in the first meeting in Manaus and the part of the data will be presented at the X Brazilian Mammal Meeting and X Brazilian Society for Bat Studies in early September 2019. Certainly, that the data will be presented in other meetings during 2020 and 2021.
- Scientific publication – We are expecting many publications from the data in the high impact of scientific journals. One first publication was accepted in the Colombian journal *Caldasia* and the preview of publication is early 2020. The product of Lilith Silva's thesis is in development and the submission of publication is late 2019-early 2020. At least two papers from my PhD are planned. One will focus on the effects of landscape structure and composition on bats-plants-ectoparasites interaction network and other paper will focus on how the intra-populational bats-ectoparasites interaction networks are structured.
- During 2020 in depending the permission we are presenting our study and all relevant issues on nature conservation for a teenagers and educators public in state schools.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

The RFG fund was used during the fieldwork expeditions that occurred over the years 2018 and 2019. The period of my Doctoral process is from 2016 to 2020 with a

total of four years' duration. Thus, the RFG funding was used in an intermediary and more expensive stage of the whole process.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Flashlight	80	57	-22	We found cheaper flashlights. The excess amount of funds was reallocated to items that were more expensive and unforeseen expenses, such as taxes and bat identification rings.
Headlamp	98	51	-47	We found cheaper headlamps; the excess amount of funds was reallocated as described above.
Rent vehicle	1373	1311	-62	The excess amount of funds was reallocated as described above.
AA and AAA batteries	137	132	-5	The excess amount of funds was reallocated as described above.
Products for storing and preserving biological samples collected in the field	45	113	+68	We collected many more biological samples (feces and ectoparasites) than expected. Relocation of funds.
Scale for weighing the bats	59	66	+7	At the time of purchase, the value was more expensive. Relocation of funds.
Gps garmin 64s	389	402	+13	At the time of purchase, the value was more expensive. Relocation of funds.
Food for days on the field	915	1052	+137	Due to logistical difficulties, we did more field work than planned. Relocation of funds.
Fuel to go to the field	1100	1103	+3	Relocation of funds.
Fifteen aluminum poles for assemble the nets	206	155	-51	We found a cheaper brand. The excess amount of funds was reallocated as described above.
Six mist nets to capture bats	563	415	-148	We found a cheaper brand. The excess amount of funds was reallocated as described above.
Bat identification rings		120	+120	Although not provided for in the project, our identification rings

				were not sufficient, and we need to buy more to know bat recapture rates. Relocation of funds.
Government taxes for bank deposit from another country		75	+75	When I received the RSG fund, the bank had already levied two taxes (Tax to receive payment from another country and IOF). Relocation of funds.
Total	£4965	£5052	+87	The final amount was slightly higher than the RSG fund, and it was paid by me.

9. Looking ahead, what do you feel are the important next steps?

After the fieldwork and all analysis of the data, the most important forward steps are finalising the doctoral dissertation and argue it to the qualifying committee. The following steps will be the publication of the data in scientific journals and presenting the data to elementary and high public schools. Those activities are expected to occur in early 2020.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did The Rufford Foundation receive any publicity during the course of your work?

Presently, no material was directly produced from data generated but The Rufford Foundation logo will be exposed in all material as possible. For example, it will be used in the presentation of the partial results at the Brazilian Mammal Meeting on September 2019. It will be inserted as a supporter institution on the website of the Mammal Diversity and Systematic Lab (LADISMA - <https://ladisma.wixsite.com/ladisma>). And it always will be used in any scientific or educational meeting or talking. It was used on talking during a roundtable in the first congress of Zoology at the Federal University of Amazonas, Manaus, on June 2019.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Rodrigo de Macêdo Mello: this is the project of my PhD dissertation; thus, I was responsible for the choice of the subject, coordination (e.g., planning fieldwork, experimental design, logistics, purchase of materials, facilities for the team), and carried out all the fieldwork expeditions. Besides, I wrote the project submitted and approved for the Rufford Foundation.

Dr. Renato Gregorin: he is my advisor and also has participated in experimental design, logistic planning, discussion of steps, and writing off part of the text.

Dr. Wesley Dáttilo: he is my co-advisor, and he participated of discussion and project planning. He will participate of all steps of dissertation elaboration and scientific articles.

Lilith C. Silva: she developed her Master thesis using part of the acquired data and participate in all fieldwork expeditions.

12. Any other comments?

The Rufford Foundation was a very important partner because without its funding this project would not have success. In fact, the fieldwork expedition would not possible, therefore RF was indispensable.