# Final Project Evaluation Report

| Your Details | |
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| **Full Name** | Eugenia Cordero Schmidt |
| **Project Title** | Nectar-feeding bats: Habitat and resource limitations in a seasonal tropical dry forest of Brazil and inputs for their conservation |
| **Application ID** | 24057-1 |
| **Grant Amount** | £5,000 |
| **Email Address** | ecordero.s@gmail.com |
| **Date of this Report** | August 2019 |

**1. 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 |
|---|---|---|---|---|
| Determine which food-related mechanisms allows the coexistence of nectar-feeding bats taking into account morphological differences between the species | | | | We assessed seasonal variation in resource use and species composition of nectarivorous bats:<br>- We followed and ensemble of nectar-feeding bats in the municipality of Lajes.<br>- Number of captured bats with wing and snout measurements: 644 adult individuals of 5 nectar-feeding bat species.<br>- Data on activity patterns for each species: 600 individuals. |
| Identify the key food items for the maintenance of nectar-feeding bat community considering spatial and temporal variations such as precipitation and vegetation composition | | | | We collected data:<br>- In eight municipalities: Lajes, Felipe Guerra, Martins, Caraubas, Mossoró, Serra Negra do Norte (ESEC), Açu (FLONA), Baraúna (PARNA Furna Feia).<br>- In six habitat types: medium caatinga, shrubby, riparian, Copernicia groves, rocky outcrops and humid forest enclave.<br>- Pollen samples: 518.<br>- Fecal samples: 147.<br>- Resource use: These five species formed a network of interactions with 31 plant species yielding 1388 interaction events.<br>- The nectar of five cacti species was the most important food resource in the diet of the four nectar-feeding bats species. |
| Generate inputs to facilitate the future assessment of the conservation status of | | | | - Number of individuals of each species with data on activity pattern and reproductive |

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| two endemic species found in this area based on distribution, diet, roosts, reproductive and activity patterns data. | | | | status: 103 *Lonchophylla inexpectata* and 134 *Xeronycteris vieirai*.<br>- Increase in the number of records for both species: Both species were captured only in shrubby and riparian caatinga in the municipality of Lajes.<br>- Roosts: One small cave with a colony of at least 25 individuals of *Xeronycteris vieirai* has been found. No roost of *L. inexpectata* has been found. |
| Define important areas or sites for the conservation of bats (AICONs, SICONs, acronym in Spanish) based on the guidelines of the Latin American Network for the Conservation of Bats (RELCOM) | | | | We defined two AICOMs:<br>1. Pedra da Abelha in the municipality of Felipe Guerra.<br>2. Serra do Feiticeiro in the municipality of Lajes. |
| Promote the conservation of bats through educational workshops with the neighboring human communities of the studied area. | | | | We initially planned to conduct nine education workshops in the nine sampling sites. However, throughout the project we had to change some sites. We also had a long time delay due to problems with the permits to apply the evaluations in the workshops.<br>We conducted:<br>- Six workshops in three of the sampled sites.<br>- Two workshops in Natal, the state capital. This site was not initially planned. (See details below in Section 2).<br>- Total of participants: 331.<br>- Total of distributed booklets: 150. |

**2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.**

We had difficulties in two aspects:

1. Sampling sites: According to my project, the sampling sites were the municipalities of Lajes, Cerro Corá, Felipe Guerra, Martins, Caiçara do Norte

and Serra do Mel. However, due to complications in logistic aspects (distance, local guide recommendations, among others), it was impossible to collect data in Cerro Corá, Caiçara and Serra do Mel. Nonetheless, other two municipalities were included, Mossoró and Caraubas. In addition, captures were made in the three conservation units that were previously stipulated.

2. Educational workshops: We were not able to develop the workshops with the five stages as initially planned: (1) Pre-workshop evaluation; (2) Lecture "Meet the Bats": about diversity, anatomy, food types, roosts, myths and benefits that bats offer; (3) Crafting activity "Bats in the cave": each participant was provided with the necessary materials to make a paper cave and create small cotton bats to put inside the cave; (4) Post-workshop evaluation; (5) Closure: At the end of the workshop we offer snacks and refreshments to strengthen the bond with communities that, after all, are the essential figures that can directly assist in the protection of bats. We had to eliminate the pre- and post-evaluation due to a recent change in the research policies of the ethics committee due to the new presidential government. To obtain the new permissions was a long bureaucratic process that was going to take too much time. We also changed the crafting activity to one that took less time to develop. We did the activity called "bat diversity in the room". Each participant had to choose which type of bat they wanted to be: frugivorous, insectivorous, nectarivorous, hematophagous, piscivorous or carnivorous. A mask corresponding to each type of bat was given to the participants, they had to cut and paint the mask. The importance of biodiversity and the role of each species were discussed. We also decided to give candies and lollipops during the lecture as rewards for answering correctly to questions I asked, instead of offering snacks and refreshments at the end, because this was going to take longer time than what the schools could provide. We also developed two workshops in Natal, the state capital. The Zoonoses Control Center of Natal, part of the Municipal Health Department, requested to my team and me a training on bats for its employees. We taught the first part of the course, we offered not only the general bat workshop lecture, also, a practical activity about captures and manipulation techniques were performed. Approximately 50 employees from different parts of the state participated. We also established another important partnership with IDEMA (State Institute of the Defense of the Environment). I had a meeting with them in January 2019, where I proposed for them to insert my bat workshops in their environmental education program. They agreed to include my bat workshop as part of the Ecological Caravan Program so I executed a short bat course for 16 IDEMA's officers. Some of these officers will be responsible for the reproduction of the bat workshops in 10 additional municipalities. Nonetheless, due to institutional changes and problems, they will include and execute the bat workshops starting in September 2019.

   Finally, in the workshops we decided to give the participants booklets that were an easy bat identification guide for them to take home. Considering that bats do not have a good reputation with people and that in rural areas it is also very common to have bats living on the roofs of their houses or feeding in their backyards we thought that a this booklet (with attractive colorful

appearance, with large photos and little text) would be a more functional educational material than the poster we initially proposed. At the end of the activity we gave refrigerator magnets with the project logo and the phrase "FRIEND OF THE POTIGUAR BATS" (Potiguar refers to those born in the State of Rio Grande do Norte).

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

**a).** With this work we learn that nectar-feeding bats occur throughout the year and are able to keep up with caatinga's seasonal rhythm using a foraging strategy based on a group of main plant species that are consumed in both seasons, and another group of plants that are consumed exclusively or at different intensities in one season or another. The most important feeding resource for all nectar-feeding bat species was the nectar of five species of cacti. Finally, our results highlight that the variety of habitats found in the Caatinga may be structuring the guild of nectarivorous bats, where *G. soricina* and *L. mordax* presented wider spatial occurrence and *X. vieirai*, *L. inexpectata* and *A. geoffroyi* with more restricted spatial occurrence.

**b).** Based on three criteria: a) Location of areas containing species of national or regional conservation concern, b) Location of roosts with colonies of different species, and c) Location of areas containing high species richness regardless of their threat level. We defined two AICOMs, the Pedra da Abelha in the municipality of Felipe Guerra and the Serra do Feiticeiro in the municipality of Lajes.

**c).** We carried out eight environmental education workshops with a total of 331 participants including children, teenagers and adults and distributed more than 150 easy bat identification guides. Additionally, the training of the IDEMA officials was essential to ensure the multiplication of bat workshops in a bigger geographic scale.

**4. Briefly describe the involvement of local communities and how they have benefitted from the project.**

The project related to local communities in different ways. During the environmental education workshops, strong links were formed with teachers and students. An example of this is the fact that a project on bats will be presented at the Pedro II State School scientific fair. We kept in contact with a group of students from this institution to help them prepare their project. In this high school, three workshops were held with approximately 135 participants (it is the largest school in Lajes, the municipality where we collected data more intensely during the present project). We trained at least eight local guides in bat capture and handling techniques. These guides also received payment for their services; likewise, we also collaborate with the local economy, buying local products and paying for lodging and food in small lodging and/or houses of local families.

**5. Are there any plans to continue this work?**

Yes, we looked for other sources of funding to continue the environmental education workshops and to be able to expand the study of bats in the field (mainly

in caves). Juan Carlos Vargas, a member of my team won the early career grant funding from the National Geographic Society. With National Geographic's financing we will conduct more environmental education workshops in which we will continue using the materials purchased with this Rufford's financing. The next workshop will take place from September 25 to 26, 2019 in the Furna Feia National Park. This workshop is important since it will be the first official workshop in partnership with IDEMA. Thanks to this Rufford's financing, I conducted a training workshop on bats to IDEMA's officials with the intention that the education workshops with bats were carried out on a larger geographical scale. IDEMA will be responsible for multiplying these bat workshops in at least 10 municipalities that were not initially planned, as part of their Ecological Caravan Program.

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

Publishing scientific journals our results on diet and coexistence (at least two articles). Present results in scientific meetings, I will present these data in the X Brazilian Mammalogy congress together with the X bat research meeting (September 9- 13 in São Paulo, Brazil). Additionally, as mentioned before, we will continue doing educational workshops around the state of Rio Grande do Norte. We will also present this project at the BioForum of the University of Rio Grande do Norte, this is a perfect space to disseminate our research project and encourage undergraduate students to continue the study of bats in the state. Finally, a Facebook and Instagram account of the project "Morcegos Potiguares" were created where we have been sharing the results of the project through photos and interesting information about local bat species and plants.

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

The grant was released in March 2018, my due date was supposed to be March 2019. Nonetheless, in January 2019 I asked for a time extension until July 2019 because of the delays in the educational workshops and the laboratory phase. Unfortunately, by the end of June I had to ask once again for an extension until August 2019, because of the half-year school recess affecting the workshop dates. Additionally, the certification process of the AICOMs took more time than expected (approximately six months). I officially completed this project on August 26, 2019 with the development of the last three environmental education workshops.

**8. Budget: 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. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.**

| Item | Budgeted Amount | Actual Amount | Difference | Comments |
|---|---|---|---|---|
| Natal-Bahia round-trip ticket for pollen identification | 120 | 177 | +57 | The ticket was more expensive than budgeted. The difference amount was extracted from the "Transport "item. |
| Materials for education workshops and bat posters | 310 | 449 | +139 | Workshop materials were a little more expensive than budgeted (mainly due to the change from posters for booklets). The difference amount was extracted from the "Lodging "item. |
| Batteries AA and AAA | 50 | 117 | +67 | We ended up spending a little more money on batteries and also, we had to buy some additional material, such as microscope slides and coverslips, ropes, silver tapes, a cooler, machete and gloves. The difference amount was extracted from the "Meals "item. |
| Local guide and field assistant | 1414 | 1414 | | All the money destined to the payment for guide services and field assistance was spent. |
| Transport (car rental, fuel, bus) | 1296 | 1319 | +23 | The difference was used to pay the extra amount of money from the plane ticket from Natal-Bahia (where I did the laboratory analysis). |
| Meals | 720 | 653 | -67 | The difference was used to pay the extra amount of money used to buy more batteries and extra materials. |
| Lodging | 1090 | 951 | -139 | The difference was used to pay the extra amount of money used for the educational materials. |
| **TOTALS** | **5000** | **5080** | **+80** | These extra £80 were paid with the National Geographic Early career grant |

Exchange rate £ 1 = R$ 5.0840 (28/08/2019)

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

The publication of scientific articles is essential to formalise the results found during the fieldwork. In addition, these results will be presented in the next 10th Brazilian Congress of Mastozoology and the 10th Brazilian Meeting for the Study of Bats (September 9 - 13, 2019).

Throughout the development of this project we created important working links with government organizations such as Zoonosis Control Center (CCZ), Secretary of State for Public Health (SESAP), Institute for Sustainable Development and Environment (IDEMA), and the National Center for Cave Research and Conservation (CECAV); we will continue working with them, providing information and training on bats.

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

Yes, in booklets, t-shirts and presentations in the developed courses and workshops and also during lectures in the university where I had to present my PhD project (See logo in photos).

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

**Eduardo Martins Venticinque**: scientific advisor, worked with methods, data analysis interpretation, and scientific publications

**Bernal Rodríguez Herrera**: scientific advisor, worked with methods, data interpretation, and scientific publications

**Marco Tschapka**: scientific advisor, worked with methods, data interpretation, and scientific publications

**Juan Carlos Vargas Mena**: He was my partner in the field collecting data and in the execution of the educational workshops.

**12. Any other comments?**

I am extremely grateful to The Rufford Foundation for the financial support to develop this work that brought immense advances to the knowledge of bats and plants in the state of Rio Grande do Norte and strengthen the importance of certain areas for the conservation of bats. Additionally, I want to give special thanks to Jane Raymond for always answering my questions quickly and kindly and for helping me solve problems throughout the project.