

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	Priscilla Alpízar						
Project title	Diet, gut microbiome, and immune system of a nectar-feeding bat in intensive banana plantations in the Caribbean Costa Rican lowlands						
RSG reference	20385-2						
Reporting period	March 2017 – March 2018						
Amount of grant	£4995						
Your email address	prialp55@gmail.com						
Date of this report	April 19 th , 2018						



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
Assess the effects that intensive banana monocultures have on nectar-feeding bats by exploring the relations between habitat alteration, diet, gut microbiome and immune system condition.				During the final fieldwork session, I managed to obtain a high number of samples from the three studied habitats, so all field work was successfully concluded. Pollen samples from my previous field sessions have been analysed, and faecal samples extracted. To fully achieve my objective, the next months will be dedicated to laboratory work and analyses. Laboratory equipment has been purchased, and I expect to finish the laboratory analyses in June 2018.
Explore the effects of agrochemicals on the animals' gut microbiota and immune system.				Nectar and water agrochemical analyses will be performed in a cooperation with the IRET (Regional Institute of Studies in Toxical Substances) in the Universidad Nacional de Costa Rica (UNA). During the last field session, I obtained around 20 samples, so we can test whether sample size and procedures work out properly. I will have 15-20 more field nights in January 2019 to obtain additional samples for this aspect of my thesis. During this time, I will also obtain faecal and blood samples from bats, so that all analysed samples are from the same period.
Determine the home range and foraging areas of Glossophaga soricina within banana plantations.				We found funding and purchased the telemetry radios. Fieldwork for telemetry is planned for this year. It will be performed under a Costa Rica- German student cooperation.
Create local environmental education programs, which could potentially translate into				I have put together a team of people from different areas (environmental educator, photographer, illustrator, and writer) to develop an



local management	environmental education programme
programs to aid in bat	in Bribrí. We are working in
conservation.	cooperation with Platanera Río
	Sixaola (an organic plantation) and
	the San Box school. The programme
	targets adults and children in the area
	and aims to teach them about
	healthy coexistence with bats and for
	them to come up with small
	conservation projects. The
	programme is partially funded by a
	National Geographic Society Young
	Explorers Grant, and we are currently
	looking for additional funding.

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

The main difficulty so far was obtaining the samples at the forest sites. As described in my proposal, I focused my efforts in forest patches, but I found that the abundance of *Glossophaga soricina* was extremely low in these areas. In aims to solving this problem, I extended my last fieldwork session for two and a half months (January to mid-March 2018). In addition, I looked for *G. soricina* roosts inside the forests to try to increase my sample size. I found a small roost with around 10 individuals in the Caribbean forest patch, which helped.

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

- Information regarding the wellbeing of nectar-feeding bats in banana monocultures: In Costa Rica as well as in other tropical countries, monocultures comprise a vital part of the economy yet biodiversity plays often also a major role for the tourism industry. Finding a balance between these two economic paths is vital. Our project will generate innovative and interesting information about the interaction between altered and intensively managed agroecosystems and the local wildlife.
- Interest and close cooperation from plantation owners and workers: the information generated can have no impact unless it reaches banana plantation owners and decision makers. For that reason, I have been putting special emphasis on informing them about my findings and keeping their interest towards how to mitigate their ecological footprint. Once my results are published, it will become easier to meet them and come up with joint conservation management programmes.
- Interest from community members after our environmental education workshops: the main objective of our environmental education programme is for the community to actively participate in bat conservation, and develop with them small initiatives towards this goal. After our initial workshops, we



came up with a list of interested members of the community who have committed themselves to work with us. We are convinced that successful conservation efforts require local actors who take care of their own biodiversity as they are ultimately the ones to benefit from it.

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

Local communities are included in this project through our environmental education program. Due to their surroundings, people who live in these areas are usually confronted with bats living in and near their houses. This tends to inspire fear and uncertainty since they are worried about the health risks of bat, they are often of the opinion that every bat is a potentially harmful vampire bat, while at the same time they are not aware of the range of important environmental services that are provided by bats. Therefore, our hope is that by learning about bats local communities will find an interest in their conservation and will learn how to coexist healthily with these animals. In addition, we want to motivate communities to create their own micro-projects, so that their community will become an example for bat conservation. This could potentially increase rural tourism in the area and create new jobs and income.

5. Are there any plans to continue this work?

Yes, there are plans to continue this work. I am currently doing laboratory work on the samples I have brought from Costa Rica. I expect to finish the lab work on the microbiome in June 2018 and begin then with the bioinformatics analysis. Parallel to this, I will finish analysing the pollen samples that will allow me to describe the diet of *G. soricina* individuals in banana plantations and compare this with the situation of animals foraging in natural forests. Finally, towards the end of the summer I will start with the leukocyte profiles.

In addition to my thesis' objectives, I have discussed potential new questions together with the Regional Institute of Studies in Toxical Substances (IRET) in Costa Rica. The institute focuses on ecotoxicology, and jointly we have a high interest in understanding the effects banana plantations have on bats. Additionally, we are currently exploring possibilities for larger cooperations in the future.

The environmental education programme is ongoing. During January and February 2018, we conducted workshops with adults and kids in order determine their initial thoughts, myths and misconceptions regarding bats. Using this information, we are now assembling the material we want to include in a book that will be used in the final workshops next year. The book will be for families, including a part for adults with photographs and more complex information, and a part for children featuring an illustrated story and activity pages. We expect to print the book next December 2018 and to deliver it to the community in February 2019.



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

The results of my work will be shared to the scientific community via papers and presentations in conferences. In addition, I plan to give small talks in Costa Rican universities, so local students learn about their country's monocultures. Nonetheless, for my results to have a stronger impact, I believe it to be crucial to share my results also with banana plantation owners and decision makers in Costa Rica. I am in direct communication with the sustainability departments of the companies that allowed me to do my fieldwork in their plantations. Once my study is finished, I will aim to develop together with them joint management programmes that contribute to improve the ecological footprint of the plantations, particularly the consequences for bats. In addition, I will share my work with local communities via our environmental education programme. We are currently working with one community and company, and are looking to access to more places to implement our programme.

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

This Rufford Foundation grant was used between March 2017 and March 2018, time that represented the ending of the fieldwork of the project, thus only 1 year of an almost 5-year effort. The academic part of my project began in early 2015 with my first fieldwork session and is expected to end in December 2019. The new environmental education aspect, just started in January 2018 and we expect to keep it going for as long as possible in order to reach a large number of communities.

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
Third field session: housing (main researcher and assistant)	804	1900	1096	Costs increased due to additional two and a half months in the field
Thirdfieldsession:insurance(mainresearcherand assistant)	94	188	94	Costs increased due to additional two and a half months in the field
Third field session: transport	472	1062	590	Costs increased due to additional two and a half months in the field
Third field session: meals (main researcher and assistant)	472	1000	528	Costs increased due to additional two and a half months in the field
Laboratory equipment	3153	3153	0	*Local exchange rate: 1£= \$802.75



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

The most important next step is to finish the analyses and have concrete results to present to banana plantation owners. I think that most of them are keen on trying to mitigate their effects on wildlife and my study represents quite a new area of information for them in Costa Rica. Thus, I would like to approach them with concrete management ideas as soon as possible, so we can keep moving forward into more environmentally conscious monocultures.

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

The Rufford Foundation logo was used in all talks about the project. The foundation has also been mentioned when asking for additional grants.

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

Prof. Dr. Simone Sommer and **Prof. Dr. Marco Tschapka** are my advisors in Ulm University in Germany. Prof. Dr. Sommer has broad knowledge about molecular analyses of the gut microbiome, and she and her team have introduced me into laboratory work and bioinformatics. Prof. Dr. Tschapka, is a nectar-feeding bat specialist, has been a great guide during fieldwork (e.g., how to increase my sample size) and during the diet part of the study, e.g., pollen identification.

During this year, I also worked together with **Ricardo Sánchez**, a Costa Rican master's student, who helped as a field assistant and is now going to be part of the telemetry aspect of the project. We also cooperated with **Allan** and **Carolina**, banana plantation workers that were extremely interested in bats and joined us during fieldwork in their spare time. Allan worked as an extra field assistant, is now fully capacitated to mist-net, and identify Costa Rican bats. Carolina joined us for some nights and learned about bat ecology and identification.

The environmental education project is composed of two members: Jennifer Sánchez (environmental educator and interpreter) and Julian Schneider (photographer). Jennifer directed most of the workshops and taught me how to work with groups of people in environmental education. She is currently also processing the information we obtained during the workshops, so we can decide what to include in the books. Julian photographically documented the environmental education process and took photographs of the bat species found in the organic banana plantation to include in the book. He is also designing the book and provided pictures to an illustrator for the children's story who we have hired for doing initial sketches of our bat characters.

12. Any other comments?

None.