

Final Project Evaluation Report

We ask all grant recipients to complete a project evaluation that helps us to gauge the success of your project. This must be sent in **MS Word and not PDF 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 – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Complete the form in English and be as concise as you can. Note that the information may be edited before posting on our website.

Please email this report to jane@rufford.org.

Your Details	
Full Name	Melissa Esther Rodríguez Girón
Project Title	Genetic diversity of <i>Artibeus jamaicensis</i> and <i>Glossophaga soricina</i> , in forest remnants surrounded by shade coffee plantations and grasslands in El Salvador
Application ID	18774-1
Grant Amount	£5000
Email Address	melissa.rg784@gmail.com
Date of this Report	March 1st 2017

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
<p>To determine the genetic diversity characterizing two phyllostomid bats (differing in size and feeding behaviour) in forest remnants with two different matrices.</p>				<p>I did the genetic analysis for <i>Artibeus jamaicensis</i> and my manuscript draft is being reviewed to be published in the book Conservation Genetics in 2019. For the other species (<i>Glossophaga soricina</i>), had finished the genetic analysis in collaboration with the Institute of Zoology in the Polish Academy of Sciences (Warszawa, Poland). Right now I'm writing and translating the manuscript so it can be published soon.</p> <p>One of the factors that delayed me to have the results sooner, was the number of samples. When I was making my field work, I spent more time than expected to get the samples. Being even harder for <i>Glossophaga</i>, which I finished the field work until late of October 2016. Moreover, once I had the <i>Glossophaga</i> samples, it took me some time to get the permits so I could sent them to Poland. They just arrived in Poland (at the end of February).</p>
<p>To estimate the bat species richness in two forest matrices (shade coffee plantations versus grasslands) that are most abundant in El Salvador.</p>				

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

The number of samples proposed were not achieved, however, I tried to get as many samples as I could in time. At the end I analysed 100 samples for A.

jamaicensis and 70 for *G. soricina* were sent to the Institute of Zoology in the Polish Academy of Sciences (Warszawa, Poland).

The permits to get the samples out of El Salvador also took more time than expected.

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

- To know the genetic diversity and genetic structure of *Artibeus jamaicensis* in El Salvador, is giving us an idea that there could be a barrier for genetic flow in this species. We are still trying to use other programs to analyse the results, so far using STRUCTURE and TESS programs both are telling us that there are two different populations, however, these programs do not discriminate for population structure lower than 2. The histogram in STRUCTURE shows that there is only one genetic population for El Salvador. However, the pairwise analysis shows there is significant genetic differentiation between some sites. The pairwise comparison of genetic differentiation among sites, showed that Río Sapo has 10% genetic differences with Gotera that is the closest site to Río Sapo (only 25 km away), which does not represent a barrier for a species like *A. jamaicensis*. This might be due to Río Sapo location, which is closest to other forest fragments in Honduras, that are bigger and the species might find more roosting and feeding resources (i.e. Guajiquiro Biological Reserve). Another explanation for the genetic differentiation between these two sites could be due to flying distance differences of the species, as it can vary from one site to another, depending on the habitat characteristics. According to Morrison (1978), females at Barro Colorado moved less (0.6 ± 0.4 km) than females at Chamela in Mexico (8 ± 2 km). This difference is related to *Ficus* trees synchrony in fruiting at a specific site (Morrison 1978).
- Other pairwise comparison in genetic structure that has significant genetic differentiation is Río Sapo with La Hacienda ($F_{st}=0.110$), that can be explained by the distance between them (136 km) but there are other sites more distant to Río Sapo where there are not significant genetic differences. Despite the fact that no genetic structure was found in *A. jamaicensis* due to its high mobility and generalist behaviour, we consider the habitat loss levels and fragmentation may represent a barrier for gene flow in some other forest dependent bat species. For instance, the genetic structure showed by the pairwise comparison between Río Sapo and Gotera, and between Río Sapo and La Hacienda may suggest some gene flow limitation.
- Considering El Salvador is the most fragmented country in Central America, now using bats as a focal group, we know that the matrix surrounding the forest remnants is important. We found that the bat species richness for phyllostomid bats is not significantly different, but the bats abundance varies significantly according to this landscape element, being higher in forest remnants surrounded by shaded coffee plantations than grassland matrix.

- For *Glossophaga soricina* we found lower genetic diversity compared to *Artibeus jamaicensis* in El Salvador. The reason for a lower genetic diversity could be due to smaller population numbers or less mobility in *G. soricina* compared with *A. jamaicensis*. Moreover, there is only one genetic population of *G. soricina* in El Salvador, but as in *A. jamaicensis*, there are some sites with significant genetic differences. In the case of *G. soricina* those differences are caused by a low migrant number (lower than one) among the sites (El Imposible with Cerro El Tigre; El Imposible with La Hacienda).
- Our results proved that even for mobile species like bats, there could be genetic differentiation within a degraded habitat, as in that landscape, species have less likelihood of resilience. The low numbers of migrants for some sites is causing inbreeding, both in *A. jamaicensis* as in *G. soricina*.
- With this research, the students of the Bat Conservation Program of El Salvador were able to learn new techniques in the field and also we found a new distribution record for a rare species in our country. We found a new locality for the bat *Enchisthenes hartii*, which was thought only to be in Western El Salvador, now we found new sites in the Central area, in a forest remnants surrounded by shaded coffee.

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

We had some problems with some sites previously considered to develop the field work. At the beginning of 2016, some natural areas were more dangerous than usual for the gangs that have been in El Salvador. In some cases, we couldn't gather with the community for this issue. However, local guides and some community leaders got involved in the project, becoming field guides for the working sites and participating in some of our activities. Some of these people got benefits as they received an income for being part of the project, others gave us a place to sleep and we pay them for that service.

5. Are there any plans to continue this work?

My plans for the future is to continue this work, studying the genetic structure in other bats and other mammals in El Salvador that could be suffering from genetic flow limitations in their populations. Moreover, we have to make more efforts with the government and other institutions to increase our landscape connectivity, being an issue not only for mammals but also for other species in our country.

To do so, I have to get more funds, to develop a similar project with the students of the Bat Conservation Program and the students in our NGO. We would like to keep studying shaded coffee plantations, other crops and forest remnants as ecosystems for mammal species and the possible consequences that they might be suffering due to habitat loss.

In the near future, I would like to work with population genetics in *Centurio senex*, which is a less generalist species. I would develop the research in a fragmented landscape as El Salvador another with more forest cover as Costa Rica.

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

I had presented one of the objectives (phylostomids richness and abundance in two agricultural matrix) during the 46th North American Symposium for Bats Research (NASBR), in San Antonio, TX, in October 2016.

In October and November 2017, I presented Genetic diversity and genetic structure of *Artibeus jamaicensis* in the 47th North American Symposium for Bats Research (NASBR), in Knoxville, TN, where I won the Avinnet Award with that research. In November I presented the same research in the 2nd Latin American and the Caribbean Congress for Bats in El Salvador

We are writing three scientific articles in total, (one about phylostomid richness and abundance, another one about Genetic diversity of *A. jamaicensis* and finally, genetic diversity of *G. soricina*).

I'm working on the final report for the Ministry of the Environment in El Salvador so they can have the results.

I'm planning to present the other objective (Genetic diversity and genetic structure of *G. soricina* in the fragmented landscape of El Salvador) in the 48th North American Symposium for Bats Research (NASBR), in Puerto Vallarta, México (October 2018).

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

I've just send the remaining money to pay for the DNA extractions and molecular analysis of *Glossophaga* samples at the Institute of Zoology in the Polish Academy of Sciences. The money was sent on February 18th 2017.

At the beginning of the project we expected to use RSG, 9-10 months after receiving the money.

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
Assistant salary	1200	1200		
Lodging	600	800	200	More days spent during the field work
Food	900	1000	100	More days spent during the field work
Transport	500	600	100	More days spent during the field work
Molecular analysis <i>A. jamaicensis</i>	900	900	0	
Molecular analysis <i>G. soricina</i>	900	900	0	
TOTAL	5000	5400		

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

To share the information with the Ministry of the Environment and other stakeholders in El Salvador about the importance of the matrix and to look forward to develop projects that allow more connectivity between the forest remnants and to better understand the status of other mammals in El Salvador.

To follow up studies of genetic structure with other bat species and other mammals in El Salvador

To establish an agreement with the Museum of Natural History to properly store the samples taken of other bats species for further studies.

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?

We used the RF logo in the t-shirts that we gave the students that participated in the workshops.

The only publicity that we gave RF was during the talks and workshops we developed, and at the end of the presentation in the 46th NASBR in San Antonio, TX.

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

12. Any other comments?

Thank you for believing in the project and gave us the opportunity to develop this kind of research in El Salvador.