

The Rufford Small Grants Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Small Grants 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	Natalia Cortes Delgado
Project title	Roost use in shade coffee plantations by <i>Sturnira ludovici</i> (Chiroptera: Phyllostomidae) in Veracruz, Mexico
RSG reference	9333-1
Reporting period	01/02/2011-01/02/2012
Amount of grant	£2997
Your email address	Taliks84@gmail.com
Date of this report	13/02/2012

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
Determine the structural and floristic characteristics of the roosts used by <i>Sturnira ludovici</i> in shaded coffee plantations and cloud forest fragments in Veracruz, Mexico.			X	We did not obtain data from all radio-tagged bats (n=23) as several could not be located in spite of searching over a large area for several days. However, the data obtained from 18 roosts are sufficient to characterise the structural features that bats prefer when choosing a roost. Of all the roosts, 11 were found in coffee and seven in cloud forest. However, two roosts in coffee plantations pertained to individuals also captured in nearby cloud forest fragments.
Determine, between a landscape dominated by coffee plantations and one dominated by cloud forest, whether there are differences in the home range of <i>Sturnira ludovici</i> respect to the size and habitat type.			X	We were able to achieve this objective with the location points of 20 bats acquired during their nocturnal activities using radio telemetry. The area where bats concentrated their activities ranged from 58.15 to 0.52 ha, while the area that contained 95% of the points varied from 221 ha to 4.69 ha in coffee plantations. On the other hand, in cloud forest fragments the area where bats concentrated their activities (50%) ranged from 76.55-0.36 ha, while the area that contained 95% of the points varied from 311.30-3.93 ha.
Evaluate the relationship between the size of foraging areas and the availability of fruit for <i>Sturnira ludovici</i> found in shaded coffee plantations and cloud forest fragments.			X	These data are still being analysed; however, cloud forest sites had a higher concentration and availability of chiropterochorous fruits, resulting in bats being forced to cover larger areas when foraging in coffee plantations. The average foraging area in coffee plantations was 34.92 ha, while in cloud forest fragments this was 21.56 ha.

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

The main difficulty we faced was obtaining institutional vehicles when needed, since vehicles are a scarce resource at the Institute of Ecology and thus there is high demand by researchers. We needed

a vehicle for transportation to and from the sampling sites, to find the day roost and also to follow the bats in their nocturnal foraging activities. The competition for vehicles delayed our schedule of field trips, until a second-hand vehicle was obtained for the final field trips.

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

- Our observations indicate bats are selecting old trees that have a DBH > 25 cm, and for which roost access is free of branches or other obstacles. As there were no significant differences between sexes in roost selection, males and females appear to have similar roost requirements. In the area immediately around the trees selected by bats, there was a higher plant richness, a higher density of trees with DBH > 20 cm, and more trees with cavities and crevices than would be expected from random selection. This suggests that bats may be selecting sites with plants that offer a variety of fruits, and we observed this in several instances: bats leaving their roost typically spent some time foraging nearby before making longer flights. In addition, the greater abundance of trees that were larger and that had cavities near roosts suggests that bats might use the cavities in these trees as an alternative roosts, should there be any disturbance near their primary one.
- As expected, plant richness, cover at the roosting site, and plant density were greater in cloud forest patches than in shaded coffee plantations. However, around the roosts, there were no statistical differences between coffee plantations and forest fragments in the vegetation structure. The lack of differences could mean that bats select their roosting sites based on a set of defined characteristics, regardless of where they are located. However, the frequency with which they choose a site in the coffee plantations will depend on whether there are relicts of natural vegetation with plants that have fruit the bats can forage on, or whether there is a nearby forest fragment that can provide this resource.
- In general, *S. ludovici* tended to spend less time foraging in the coffee plantations than in the forest fragments. Furthermore, bats usually changed sites often, indicating that resources were not very abundant in the plantation. The distances covered by bats were usually greater in the coffee plantations. Radio telemetry observations indicate that when a bat foraged for a while in the plantation and moved, they typically covered a distance greater than 2 km to get to their next foraging site. For this reason, it is likely that bats will not spend much time in coffee plantations if they have to cover long distances and the resources offered are not very reliable. The foraging areas were larger for bats registered in coffee plantations since they had to cover a larger area in search of resources that were more spread out and available in smaller quantities than in adjacent forest fragments. This suggest that while coffee plantations are important landscape elements that offer some roost and food resources to bats, close proximity of cloud forest patches to plantations is required to assure conservation of frugivorous bats in this fragmented landscape.

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

Two workers at the coffee farms were taught about the ecological importance of bats in these agroecosystems, and about the types of trees and vegetation that best serve as roosts and foraging areas for bats. It was important for us to meet directly with these people, not just to provide them with this educational information, but also because they tend to the coffee crops and thus make decisions about its management that could affect bat conservation. Special emphasis was placed on describing how poor or simplistic management techniques can have a negative impact on

biodiversity, and even on the coffee production itself. We also plan to share the information obtained with plantation owners to raise awareness about the importance of maintaining both feeding and roosting resources for the bats and other fauna living there. Our goal is helping owners to understand that these animals could be severely affected or might even be driven locally extinct if only sun coffee is grown or if only simplistic management practices of the tree canopy are used in shaded coffee farms.

5. Are there any plans to continue this work?

This project will not be continued. However, new questions have arisen about frugivorous bats interactions with their natural and man-modified habitats, which are expected to be addressed in an upcoming project. On the other hand, the telemetry technique used will be applied in future studies to estimate habitat use and the distances traveled by bats in different contexts.

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

We want to produce a brochure for the owners of the sampling sites (cloud forest fragments and shade coffee plantations), showing the importance of maintaining forest fragments as well as older and larger shade trees in coffee farms to insure the viability of populations of *S. ludovici*. Owners were also given a list of tree species (with common names) used by *S. ludovici* as daytime roost near the plants providing food. For the scientific community we plan on communicating our results via the publication of 1 or 2 articles in indexed journals and presentations in conferences.

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

The RSG was used between February and October 2011, but project sampling began in September 2010. Sampling ended in October 2011. Since then I have been busy processing samples of plants and seeds, performing statistical analyses, and discussing my results with colleagues.

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
Receiver TX 1000	505	665	-160	The surplus is for shipping costs, bank transfers and taxes not contemplated before.
Radio transmitters	486	486	0	
GPS	390	390	0	
Contract field assistant	1616	2061	-445	It was necessary to extend the hiring of field assistant for two more months.
Total	2997	3602	-605	

1 pound sterling=20 Mexican pesos

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

Since many scientific studies have highlighted the potential of shade coffee plantations as a shelter for wildlife, it is important to establish the extent to which species, in this case bats, are finding resources in these anthropogenic systems. The next step in my research will be to determine what is really happening with bat diversity in this shade crop, and thus helping to formulate a successful management plan that offers good production but also provides resources for the survival of local fauna. More regular monitoring of changes in resource availability (shelter and food) in shade coffee plantations, over a longer period of time, together with changes in the abundance of bats, should provide a better understanding and help inform management decisions. In addition, the importance of forested patches found within coffee agroecosystems may be highlighted since these can provide shelter and food for different species, as in this case for *Sturnira ludovici*.

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

I have not yet produced any material for dissemination, however the RSGF logo will be in the slide show of my dissertation's seminar and presentations at scientific conferences. Everyone who helped me on the project knew about the contribution of RSG, including a person who wants to apply for similar support and asked me to provide clarifications on the proposal submission. I will also acknowledge the support from RSGF in my dissertation and in any paper published from this research.

11. Any other comments?

Although bats can find refuge and forage in shade coffee plantations, they are nevertheless still very dependent on the forest where both roost and forage availability are more reliable, and often available in the same area. Although it is important to continue to promote the rustic management and inclusion of greater tree diversity and size in coffee plantations, the conservation of forest fragments in any landscape where coffee is grown is essential for the maintenance of *Sturnira ludovici* populations, and that of other bat species as well. We hope the results will have helped promote the local conservation of forest areas close to coffee plantations, and the establishment of plantations with a shade whose composition is sufficiently complex to sustain *Sturnira ludovici* and other bat species. Furthermore, the new data obtained with RSG support include daytime roost, diet, movements and habitat use and thus make an important contribution to the natural history of *Sturnira ludovici*.