

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. 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. 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	Gloriana Chaverri
Project title	Artificial bat roosts and tropical forest regeneration
RSG reference	13949-2
Reporting period	August 2013-December 2015
Amount of grant	£5910
Your email address	gchaverri@upacificosur.org
Date of this report	December 20, 2015

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
Install 6 bat roosts			X	We have constructed 6 roosts with the funds acquired through Rufford, and 2 more with funds from other sources (figure 1). The 8 roosts were more complicated to construct and install than originally planned, and more expensive, which caused the project’s timeline to be shifted. In addition, while other studies demonstrate that artificial roosts can be colonized successfully in less than a month, we have not observed that in our current work. We believe this slow colonization is caused by boxes being located in pastures where fruit- eating bats are probably not too abundant. To date, only one bat box has been permanently colonized by fruit bats (<i>Carollia perspicillata</i> , figure 2).
Improve the colonization speed of artificial roosts by using acoustic lures		X		We have conducted playback of social calls in three different bat boxes (figure 3); unfortunately, none of those boxes have been colonized by bats yet. To confirm the effectiveness of the acoustic lure to at least attract attention from flying bats, we used a video camera in nightvision mode in addition to an external source of infrared light to record bat activity (figure 4). In one box located in a pasture but far from forest patches, we did not get any visits from bats during the time we reproduced calls. In the second and third bat boxes, located in a pasture but next to a forest fragment, we

<p>Assess seedling establishment using bat guano</p>		<p>X</p>		<p>We planted a 20 x 80 m plot of abandoned pastureland at Osa Verde, a property managed by Osa Conservation. The plot had been mowed 3 days before we sowed bat seeds. In these plots, we had 4 treatments and 4 replicates per treatment. For the treatments we sowed either 300 or 1500 seeds (figure 5) collected from 5 bat roosts with <i>Carollia perspicillata</i> colonies (figure 6). These seeds were either sown dispersed or clumped (figure 7). After 3 months we have not seen growth of these seeds, probably because the grass started to grow very quickly, and aggressively, after it had been mowed (figure 8). While this attempt was not successful, we will conduct another trial where we plough the soil to mechanically destroy these aggressive grasses and hence reduce competition with bat seeds.</p>
<p>Promote artificial roosts as a method for forest recovery projects among 5 nature conservation organizations</p>		<p>X</p>		<p>Osa Conservation, a conservation organization that we have been working closely with, has been pivotal in helping us construct and install our bat boxes in their properties. They have also allowed us to sow seeds from bat guano in their property, and have kindly helped to mow the grass in the area destined for reforestation (figure 9). This interaction with a conservation leader in the area has helped us promote the use of artificial bat roosts as tools to facilitate forest regeneration. However, as the boxes were constructed later than expected, and bats have been slow at colonizing roosts, we do not yet have results to present to other local organizations on the effectiveness of the method. While we wait for results, we have appointed a student from the University of Costa Rica to help us design a brochure explaining the method and to be distributed to as many local organizations as possible.</p>

Inform 3 communities and schools about the method, bat ecology and forest recovery			X	<p>We have presented our preliminary findings, along with information about the bats in the region, at 1 school and several local organizations and institutions:</p> <p>Saturnino Cedeño School, Puerto Jiménez, Península de Osa (Oct-2015)</p> <p>Nicuesa Rainforest Lodge: 1 talk to local guides and tourists (Apr-2015)</p> <p>University of Costa Rica, Golfito Campus: 1 talk organized by students (June-2015)</p> <p>Osa Conservation: 1 talk to college students (Jan-2015)</p> <p>Sistema Nacional de Áreas de Conservación (National System of Conservation Areas): 1 talk to various community members of Osa, including children, tourist guides, local naturalists (Mar-2014)</p>
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

The construction, transportation, and placement of artificial bat roosts were more expensive and laborious than originally expected. We had planned to finish this process on the first two months after acquiring funds, yet this did not happen until the first months of 2014. These unforeseen changes in the schedule affected the rest of the activities, which have now all been completed except we have not actively promoted the use of artificial bat roosts for forest regeneration among other conservation organizations, only Osa Conservation. We will start involving other conservation organizations until we have fully tested other methods for attracting bats to bat boxes and have successfully grown bat seeds in pasture lands.

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

One of the most important achievements of our project has been the construction of artificial roosts that will be an available resource to bats for many years to come. We believe these structures, while slow to be colonized, and will serve as an important roost-site for many bats. We hope the structures will last several years, and that they will continue to serve an important role in providing refuge for hundreds of bats that may otherwise be unable to locate suitable roost-sites in the area.

The second most relevant outcome is that we have learned that abandoned pastures may be difficult to reforest by just sowing bat seeds. Grass and other small plants already growing in pastures seem too aggressive to allow the growth of pioneer plant species that bats typically disperse. Other treatments, such as tilling, may be necessary to mechanically remove competing plants, which may substantially increase the cost and energy required to reforest a large area. However, this may still prove cheaper than attempting to manually plant trees in a similarly-sized area.

Our project has also been instrumental in promoting the use of artificial bat roosts among local organizations, and the importance of bats for forest regeneration. While our results do not strongly support the idea that bat roosts in pastures are quickly colonized, and that bat seeds can easily grow in abandoned pastures, many people that have visited Osa Conservation's properties, or have attended my talks, have learned about this method, and have even expressed interest in constructing these boxes in their own lands to attract fruit-bats.

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

Osa Conservation, a local NGO, has been deeply involved with the project. They have provided help with the logistics of locating suitable places for the artificial bat roosts, and have helped with the construction and placement of the bat boxes. We plan to involve other local NGO's once the method has been fully tested.

5. Are there any plans to continue this work?

We will continue to monitor the bat boxes for several years to come. In addition, we will also attempt to reforest the large area that has been assigned to our project by Osa Conservation using bat-dispersed seeds collected from roosts, but with a new method of soil preparation. We will also prepare and distribute brochures to local organizations and other interested members of the community about the use of bat boxes for forest regeneration. Finally, we will continue to look for other alternative methods to attract bats to boxes placed in pastures.

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

As originally proposed, we will share our results with other local NGO's through talks and brochures. We have presented our preliminary results, and will continue to do so, during presentations at local meetings for academics and the general public. We also plan to publish our results in scientific journals.

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 initially intended to be used in a period of one year, but instead it was spent in a period of two years and four months.

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
Roosts	1678	2110	-432	Construction, transportation and placement of roosts were more expensive and time-consuming than expected.
Transportation	734	859	-125	The length of the study period was extended due to slow colonization of installed roosts, which increased the costs of transportation
Subsistence of local team	2570	2749	-179	The length of the study period was extended due to slow colonization of installed roosts, which increased the costs of food and lodging
Education	928	271	657	The costs for this item pertain to expenses to hire a student to design a brochure to distribute to local organizations; this amount has already been paid, yet the end product is not ready since we are awaiting our second trial of seed germination experiments to complete the information provided in the brochure.
TOTAL	5910	5989	-79	

Local exchange rate used: 1 Costa Rican colón equals 0.0013 British Pounds

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

Our most important next step is to run a second trial of seed germination experiments, but with a different treatment of the soil: mowing + ploughing. We believe this new method will reduce competition with fast-growing local grasses. After this new trial is completed, we will finish the brochure explaining the method to local and national conservation organizations who may wish to implement this method of forest regeneration. We are very excited about the prospects of this method, since it can be used in areas plagued by aggressive grasses in need of forest recovery (figure 10).

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 presented my preliminary results during several talks at local schools, communities and organizations (see details in question 1), and used the RSGF logo in the last acknowledgement slide, where I thank funding agencies.



Figure 1. Inspection of bat roost (Gloriana Chaverri and Joxerra Aihartza-photo Stanimira Deleva).

Figure 2. A small colony of four *Carollia perspicillata* inside one of the bat boxes constructed during our study (photo Stanimira Deleva).



Figure 3. Stanimira Deleva setting up the call reproduction equipment (photo Angel Ivanov).



Figure 4. Gloriana Chaverri showing video camera setup (photo Stanimira Deleva).



Figure 5. Counting seeds with Marvin Lopez and Tabea Zimmermann (photos Gloriana Chaverri).

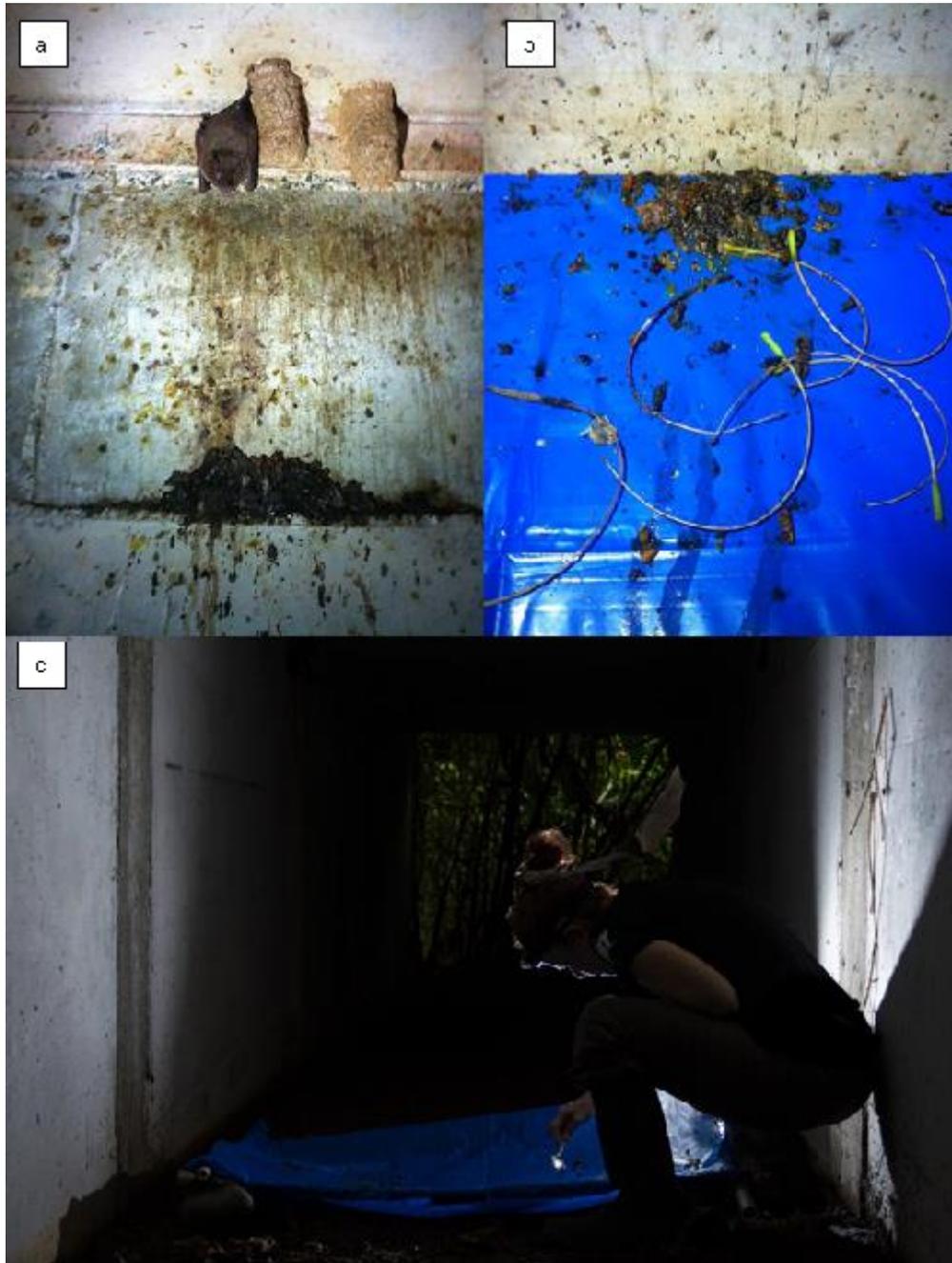


Figure 6. Photos showing a *Carollia perspicillata* (a) roosting in a tunnel, the bat droppings gathered on a plastic bat (b), and Gloriana Chaverri collecting the seeds (c). Note the bat flying towards Gloriana's head in c. Photos by Gloriana Chaverri (a, b), and Melquisedec Gamba-Rios (c).



Figure 7. Gloriana Chaverri sowing seeds (top photo), and close-up of clumped seeds sown in pastureland (bottom photo). Photos by Marvin Lopez and Gloriana Chaverri.

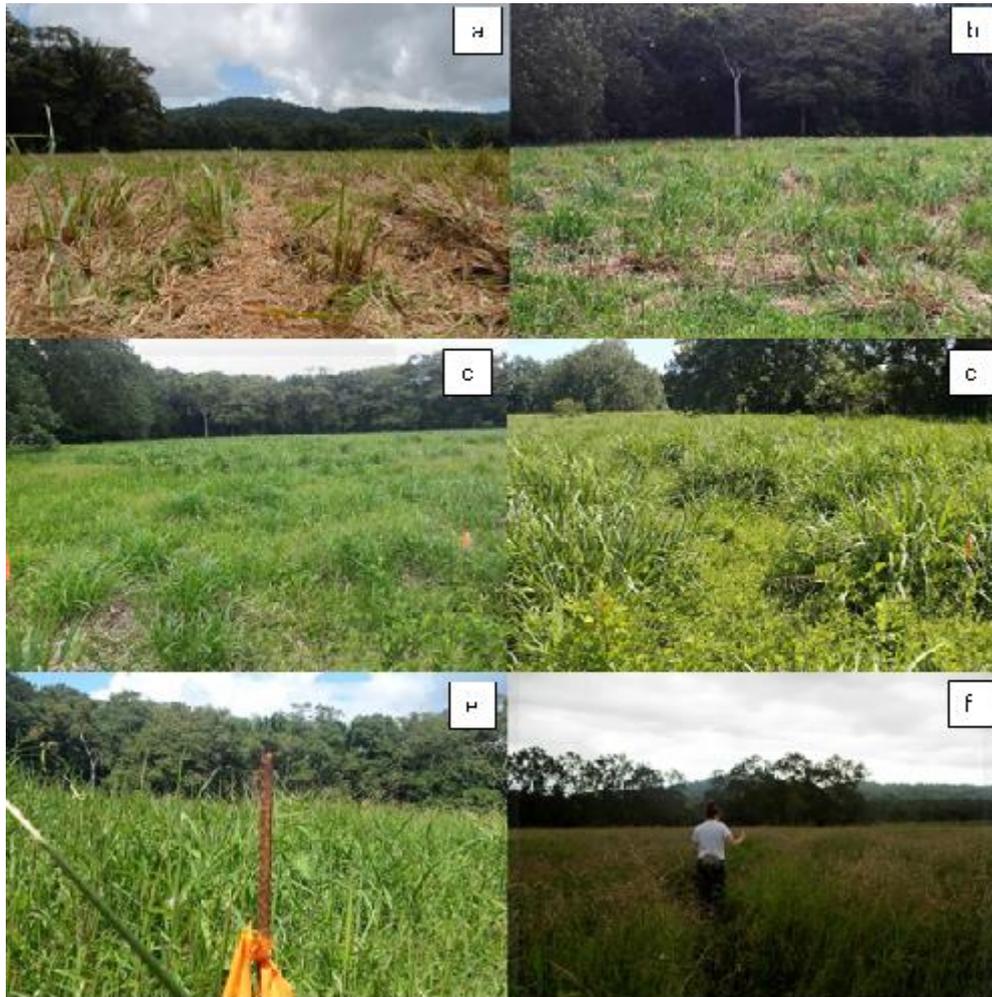


Figure 8. Photos showing the growth of grass at the experimental plot where seeds of bats were sowed (a. week 0—grass mowed 3 days before, b. week 1, c. week 3, d. week 6, e. week 11, f. week 12—Gloriana Chaverri in pasture showing relative height of grass). Photos by Gloriana Chaverri (a), Marvin Lopez (b, c, d, e), and Stanimira Deleva (f).



Figure 9. Area allocated by Osa Conservation for reforestation using bat guano (photo Gloriana Chaverri).



Figure 10. Photo of the town of Golfito, in southwestern Costa Rica, showing pastures previously used for cattle. These areas have not been able to recover even after cattle were removed 25 years ago. This is one area that can potentially benefit from forest recovery treatments using bat seeds.