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	Gerardo Cerón Martínez
Project title	Effects of fragmentation on Neotropical palm communities in Chiapas, Mexico
RSG reference	18159-1
Reporting period	September 2015 to September 2016
Amount of grant	£4946
Your email address	gerardo.ceron.m@gmail.com
Date of this report	September 12, 2016

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
To assess the edge and distance effects on palm communities			x	During the first field season we visited 15 fragments and 10 protected sites to inspect and evaluate their suitability for our purposes. Finally we selected seven fragments bordering with pasture/cattle lands and seven protected sites with a natural edge. We successfully recorded the community of palms in 14 500m transects, each with six plots of 25 x 4 m at every 100 m intervals (i.e. 0, 100, 200, 300, 400 and 500 m).
Fragment size and the community of palms				Fragment selection took a considerable part of the field season. For this particular part of the project we visited more than 23 fragments and 10 protected sites. We recorded the palm community in the centre of 18 fragments (ranging from six small, six medium and six large) and as a reference, five sites inside the protected forest. We successfully recorded the palm diversity of 138 4 x 25 m plots. Now, the second part of this objective is to use recent satellite images to obtain landscapes variables, such as: size of fragments, distance to the nearest road and village and vegetation coverage.
Evaluate palm-animal Interactions that can				Our primary goal was to have a clearer picture about the

preserve ecological processes (e.g. seed dispersal by mammals)				community of mammals active at the edge and interior of the forest in both, the fragmented and protected landscapes. This was a crucial part for the next field season experiments on seed removal by mammals.
Evaluate palm species sensitivity to fragmentation through germination experiments				We stabilised a germination experiment of palm species *Attalea butyracea*, *Geonoma* sp., *Reinhardtia simplex*, and *Bactris mexicana*. Since June (2016) we are monitoring monthly the development of the seeds. This will be assessed for 1 year (June 2017).

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

Before going into the field sites, and based on satellite images, I selected a range of potentially useful sites for my project. Unfortunately, the situation was more complex once we were in the actual site. Some of the fragments selected through the satellite photographs were neither suitable for our purposes or were cleared for cattle/crop purposes (photographs are 2-4 years old). This is one of the reasons we had to visit many more fragments, even more that the ones we had anticipated.

Additionally, and despite that the first approach to the authorities from every ejido was successful (in Mexico an ejido is an area that is farmed and maintain communally), it is important to state that even with the authorisation from the ejidal authorities, it is a personal decision of a particular landowner to give or deny access to their land. We faced scepticism from some owners that at first denied us access to their property, but once we gave them a thorough explanation of our purposes and activities they were opened to the idea. As a result, we have now a commitment with all the ejidos to go back and explain them our findings and how these results are relevant for them. In the area, some of the landowners receive payments for ecosystem services, so our results could prove valuable to demonstrate that the fragments they maintain provide a place where palms and mammals interact.

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

1. Edge effects on juvenile and adult palm community

We found 20 species of palms across the two landscapes, the protected forest of Montes Azules Biosphere Reserve (MABR) and the fragmented forest of Marquez de Comillas (MC). We found two species of palms, *Chamaedorea ernesti augusti* and *C. elatior*, listed by the Mexican authorities as threatened. These two palms were only found in the fragmented landscape of MC, therefore, highlighting the importance of preserving the remnant forest to guarantee the prevalence of the palms and their interactions.

Overall, we found an effect on the juvenile and adult palm community caused by the type of forest (protected or fragmented) and the distance from the forest edge to the core (from 0 to 500 m). Such results were detected in the total abundance (Figure 1), diversity indexes and biomass (using basal--- steam area as a surrogate).

2. Edge effects on the seedling community and the seedling to adult ratio of palms

The transition from seedlings to adult is one of the most vulnerable stages in palms. We tested if edge and distance have an effect on this transition. We found a positive effect of edge and distance on the seedling to adult ratio; this means that the edge has adverse conditions that do not allow a successful development of seedlings into juveniles and adult palms. The results on the effects of the anthropogenic activities on the community of palms provide a base line for future and more detailed studies.

3. Mammal community survey

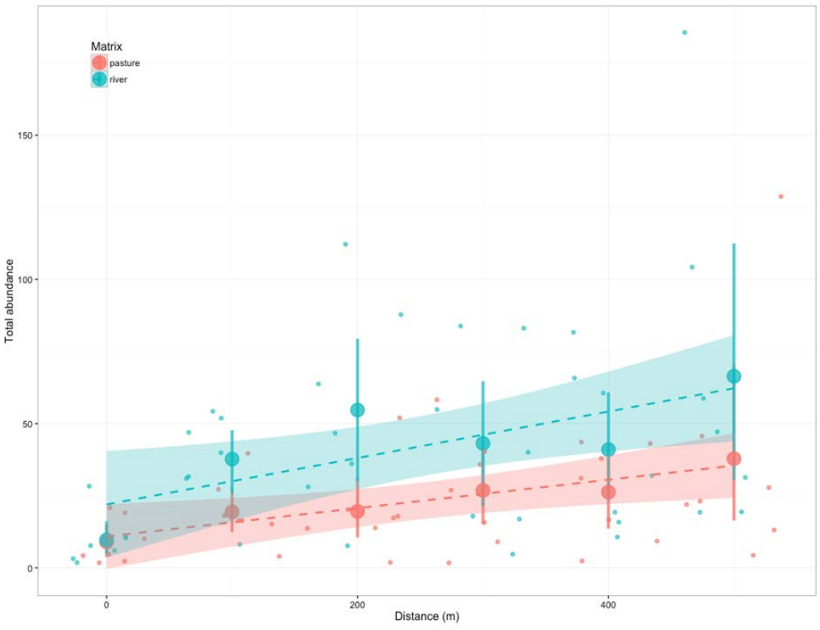
Through camera-traps, we successfully gathered information on the species of mammals that were active nearby palms at both, the edge and interior of the forest fragments at MC and the protected forest at MABC. We recorded a total of 13 mammal species. Though, two of them are not consider in our analysis, the ocelot (*Leopardus pardalis*) and the coyote (*Canis latrans*). The protected area of MABR and the fragmented forest MC had 11 and nine mammal species respectively (Table 1). The interior of fragments and protected forests were the richest, with 11 species for MABR and nine for MC. At the edge of the protected area we registered nine mammal species and only six at the fragments. In the near future I am planning to estimate and index of abundance, compiling the number of individual photos per species per day. With this information I can be more confident about the relative abundance of mammals at the sites. This will allow me to design a meaningful experiment involving the mammal community and seed dispersal of palms for the 2017 field season.

Figure 1. Mean total abundance of palms per type of forest (pooling all steams and clones of adults and juveniles) ± 95 % confidence intervals. Pasture (salmon) and river (blue) correspond to the fragmented and protected landscapes respectively. The dotted lines represent a fitted linear model and the shaded area the SE of the regression.

Table 1. Mammal species recorded in forest fragments (FF) and continuous forest (CF) from February to April 2016.

Family	Species	Common name	Forest type
Tayassuidae	*Pecari tajacu*	Collared peccary	FF,CF
Cervidae	*Mazama americana*	Red brocket	FF, CF
	Odocoileus virginianus	White-tailed deer	FF,CF
Tapiridae	*Tapirus bairdii*	Baird's tapir	FF, CF
Cuniculidae	*Cuniculus paca*	Lowland paca	FF, CF
Dasyproctidae	*Dasyprocta mexicana*	Mexican agouti	FF, CF
Mustelidae	*Eira barbara*	Tayra	CF
Didelphidae	*Didelphis virginiana*	Virginia opossum	FF, CF
Procyonidae	*Potos flavus*	Kinkajou	CF
	Nasua narica	White-nosed coati	FF, CF
Sciuridae	*Sciurus* spp.	Tree squirrels	FF, CF

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



The unprotected study area extends across 7 ejidos, therefore the first step was the formal introduction of the project and the team to the authorities of each ejido. The approach to all the communities was positive. Overall, we received a good acceptance from the communities. The involvement of some individuals as field assistants from each one of the communities was crucial to

accomplish our aims. We have now one person with a fixed monthly salary that follows the germination experiments. The commitment is for 20 h/month, so it allows him to also dedicate time to his own activities.

It is important to state that people from all ejidos expressed interest in receiving the information about the diversity of palms and mammals. We will inform that this new information can be used to further reinforce the importance of forest fragments to the governmental payment for ecosystem services scheme.

5. Are there any plans to continue this work?

Yes, at the moment I am in the data analysis stage and in the process of refining the experiments for the 2017 field season.

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

I am planning to present my work at the annual meeting of the Association of Tropical Biology and Conservation in July 2017. Additionally, I am aiming to publish my results in peer-reviewed journals and in a Mexican popular science magazine for a non-specialist audience. Also, a practical and informal document on palm species and their importance (including those that are threatened) will be prepared for the ejidos.

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

I used the funds provided by the RSG between November 2015 and June 2016. Although the field season started as planned, the survey stage was longer than anticipated, as stated before. Despite the delays, we fulfilled our main aims for the first field season and I am refining details to carry on the second and finally field season, starting in January 2017.

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. 1 £ sterling = 4.44 Nuevo Sol

Item	Budgeted Amount	Actual Amount	Difference	Comments
1 field assistant (£12/day/approx. 120 days)	1400	1800	400	Site selection and data collection took longer than we anticipated; therefore we needed an

				extra month of field assistance (150 days).
1 GPS Magellan eXplorist610	259.95	240	19.95	Instead of the original GPS budgeted I bought a cheaper and more reliable Garmin GPSMAP 64s Hiking GPS Navigator
1 pack of Duracell alkaline AA rechargeable batteries (£25.99)	0	25.99	25.99	We needed this batteries for the GPS
8 camera traps Cuddeback Capture Long Range IR E (Model E2) (£96.99 each)	775.92	800	24.08	I bought 10 Acorn Ltl-5210A cameras (£80 each)
Taxes paid for the Photographic equipment	0	100	100	We had to pay taxes at customs in Mexico for the camera traps
2 Duracell alkaline battery 24-pack (£14 each)	0	28	28	This batteries were needed for the camera traps
2 measuring tapes 100m (£16.40 each)	32.80	32.80	0	
1 botanical press	22.99	22.99	0	
Notebooks, maps, pencils, markers, plastic bags.	50	40	10	
1air fare UK-Mexico-UK (£680)	680.00	645.00	35	There was a slightly change in tickets prices
1air fare Mexico City-Chiapas-Mexico City (£133.59)	133.59	119.50	14.09	There was a slightly change in tickets prices
ADO coach ticket to and from Tuxtla airport Comitan City (£20 each)	0	40	40	
Petrol and	540	570	30	We had to make extra

motorbike (x1) hire for two people (£3.6/day/150 days				trips looking for suitable study sites.
Room in a shared cabin (approx. 150 nights at £7/night)	1050	1050	0	
Total	4945.25	5514.28	569.03	

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

We need to make sure that the germination experiment continues to be successful. It is also a priority the establishment of the seed removal experiments to test the hypothesis that fragmentation and edge effects have an effect on the seeds' fate. We also plan to continue with the mammal abundance and diversity assessment in both, MABR and MC.

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?

I have not used the RSGF logo just yet, but I will when presenting the results to the local community and in a scientific meeting.

11. Any other comments?

I want to take this opportunity to show my deepest gratitude to The Rufford Foundation for the RSG granted to me. Without their support, I could not have successfully started this project.

Appendix

Some of the mammal species that feed on fruits and seeds of palms

Tapirus bairdii

Pecari tajacu

Nasua narica

Mazama americana

Photos from the fieldwork

Photo 1. GCM (left) and field assistant Chilo (right) during the periodic inspections for the camera traps, we checked the battery charge and download the photos.

Photo 2. Fragment selection at Boca de Chajul.