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	Fernando Zamudio
Project title	Stingless bees (Meliponini) and palmitos (*Euterpe edulis*): ecosystem services and conservation of pollinators of socio-economic interest in the Atlantic forest of Misiones, Argentina
RSG reference	12055-2
Reporting period	October 2012 - October 2013
Amount of grant	£6000
Your email address	zamufer@yahoo.com.ar
Date of this report	30th October 2013

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
Fieldwork		X		85% of the field work has been done to date, during August and September of 2013 in Iguazú National Park. We work in two places ("palmitales") and climbed more than 70 palms to perform different activities proposed in the project (put treatments, catch insects and put in handycam). Only remains to return to the field to complete the treatments (output) on pollination (see below). Note: The field work was delayed since the awarded grant money became effective after flowering in 2012.
Determine reproductive output of palm individuals subjected to different pollination treatments		X		We work in two places ("palmitales") where we put four pollination treatments (open-pollination, spontaneous self-pollination, wind pollination, pollination by stingless bees) in 40 palmettos. In total we placed 160 treatments. Additionally hand-pollination was performed in 10 palmitos using for this other palmitos male flowers of the same site. To complete this goal, only remains return to the field to count the number of fruits grown in pollination treatments and thus to calculate the fruit set. This work will take place in November 2013. Data analysis has not been performed completely since the short time since the fieldwork to the present.
Determine the diversity of insects visiting the palmito inflorescences		X		We collected insects with hand nets during samplings of 30 minutes in a total of 29 palmitos. Of these, 17 were performed in female open flowers and 12 in male open flowers. In turn nine samplings were performed during the morning, eight at midday and 12 afternoon evenhandedly distributed between male and female flowers on both sampling sites. So far only been identified bees belonging to the tribe Meliponini (two species of genera *Plebeia*, *Trigona spinipies*, *Tetragonisca fiebrigi*, *Tetragona clavipes*, *Oxytrigona tataira*). The other insects collected will be identified by specialists in subsequent months (flies, wasps, bees other, etc.).

				Data analysis has not been performed completely since the short time since the fieldwork to the present.
Determine the frequency of insects visiting the palmito inflorescences		X		We film 20 palmettos over periods of 2 and 4 hours. Of these 13 in female open flowers and seven at male open flowers. These were made during the morning in four palmitos, six at midday and 10 in the afternoon, and were evenhandedly distributed between male and female flowers on both sampling sites. The most common insects visiting the inflorescences are different species of stingless bees, flies and wasps. The honeybee (*Apis mellifera*) was uncommon and generally visited male flowers for pollen and very low frequency in female flowers. Among the stingless bees, species of the genus *Plebeia*, and *Tetragonisca fiebrigi* were the most frequent in both male and female flowers. Antagonistic relationships were observed between some species of stingless bees which promotes dominance of one species at a time in different palm filmed. Data analysis has not been performed completely since the short time since the fieldwork to the present.
Analyse current management practices related to the collection of seeds of Palm in the North of Misiones: (a) methods and harvest period, (b) average annual yield of seeds (kg), (c) number of users engaged in the harvest activity, and (d) data related to seed commercialisation.			X	See resume in outcomes section (3).

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

The major unexpected difficulties were related to the methodology and logistics for field work. We had to adapt the methodology that has been little developed in palms, which unlike the trees have no branches, are high and have large inflorescences with a particular structure. To do this we had to design and build two chairs ("palmitera chair") to allow us to work comfortably in the height and proximity to palm flowers. These chairs were built by a blacksmith with welded square pipes and a wooden seat. To fasten the palmitera chair the trunk of the palm we used two ratchet strap on each end. During the testing process of placing the chair in field we realised we had not tended properly

consider security measures so we decided to buy safety harnesses and ropes to climb the chair by a pulley, being sure (tied to trunk) from above.

Another problem was related to the filming. Given the three-dimensional structure of the inflorescence and the movement caused by wind, the cameras could not focus on rachillas do (did focus on background vegetation between rachillas). In this way we had to design and build two aluminum structures (camera support) that allowed us to put, between 8 and 10 rachillas in one plane and with a light colored background (cardboard) to achieve contrast and focus. This structure consists of a base where the camera is placed, which in turn is bonded to an aluminum frame (10 x 10 cm) at 20 cm away from the camera. In this way rachillas move together with the camera and can focus on 40-100 flowers at a time.

These unexpected drawbacks led us to look again the budgeted expenditures in the original proposal and allocate money to build palmitera chairs, cameras supports, and buy harnesses and other safety features.

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

While we still await the results of fruit set that will allow us to finally meet the palm pollination system (self-pollination, wind pollination, or insect pollination?), we believe that the main results to date are:

a) We have numerous findings that will allow us to make innovative advances on pollination ecology of this important palm. We have over 60 hours of filming, 14.5 hours of insect collections (approximately 1,000 individuals) and 160 pollination treatments in 40 palms.
b) According to the hypothesis that we propose, stingless bees would be important pollinators of palm because they visit both male and female flowers, have a high frequency of visits to flowers and present foraging behaviors conducive to pollinate the flowers (visit many palm flowers, move from one flower to another and carry pollen in the whole body).
c) We have an appropriate characterisation of the management system used in harvesting palm seeds on the rules and legal procedures required for use, and the seed marketing system in particular the link between producers, intermediaries and growers that will allow perform management proposals and make inter-institutional discussions to ensure the sustainability of the activity and conservation of palm. To summarise we can say that the harvest of palm seeds is an activity restricted to some micro-areas of Misiones (it is not an widespread tradition among families) and depends on the demand of collectors and nurserymen. This activity is developed through permits granted from the Ministry of Natural Resources of the Province of Misiones after producers submitted a folder with data about your forest stand (number of hectares with palmitos, estimated number of palmitos, etc.) and other personal information. At the community level this is a family activity that is performed independently and without an organisation among producers to allow greater benefits. At the farm level, this activity is performed without a management plan which takes into account the effects of harvest on regeneration of palmital and seed dispersal. The harvest volume is irregular and varied from year to year depending on household production strategies. This ranges from 1500 to 5000 kg of seeds per season and the kilo price ranges from $ 1.5 to $ 3. In this way farmers can earn up to $ 15,000, which allows producers to buy materials, difficult to acquire with other activities (good amount of cash) as vehicles (motorbikes or cars), machinery, among others.

d) We adapted the methodology and technological improvements that were generated may contribute to the continuation of this project and others carried on pollination of palm trees around the world.

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

The project did not involve local communities directly but I think the results may be useful for the development of management strategies that contribute to the generation of productive alternatives, built upon local resources and practices. That is, production systems, socially and environmentally sustainable. Together with the previously developed information and knowledge about bees and its ethnobiology (my doctoral thesis), the first RSG obtained ("Native stingless bee (Apidae : Meliponinae) Diversity and Ethnobiology in the Atlantic Rain Forest of Argentina") and the work of colleagues on floral resources used by Meliponini bees (work done by Biologist Fabio Flores in the National University of Jujuy) we will be able to test the breeding of some species of stingless bees in agroforestry systems which combine palm, timber or non -timber trees and annual crops.
Moreover, two students of biology (Ana Clara Venier and Pablo Ramello), a ranger (Marcio Antunes) and a young mbya belonging to the indigenous community of Yryapú (Raul Correa) participated in various stages of research in Iguazú National Park.

5. Are there any plans to continue this work?

I plan to make some supplementary sampling insects in subsequent years in order to capture the variability of pollination system. But even more important is to extend this type of study in other plant species of ecological and economic importance. I think that while more we understand the interrelationships of plants with insect pollinators, especially stingless bees, we can generate better arguments to preserve this diverse group of insects, which are generally underestimated in its ecological and cultural role. In this sense I think will be very important to create dissemination campaigns at local and regional levels and in various sectors of society (farmers, technicians, conservationists and members of the state), to generate awareness about the importance of conserving the ecosystem services provided by insects and stingless bees in particular.

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

We will disseminate the results of this project through formal academic channels such as publications in journals and conference presentations on related topics but also a less formal way as the generation of a "Field Identification Guide" on stingless bees of Misiones province which will be aimed at a diverse audience as rural teachers, technicians, rangers and biologists (found in 70% done). Moreover we plan to develop dissemination campaigns which gather all the information and knowledge generated to date. The latter activity is planned as a medium-term goal, in collaboration with colleagues from different disciplines and institutions (governmental and nongovernmental).

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

In our case the RSG was used prior to field work (70%) when we bought most of the equipment (ladders, handycams, fabrics and entomological material, palmitera chair and camera support aluminum structure) during fieldwork (20%) to pay salaries, purchase of food and lodging and gasoline for the vehicle, and the rest (10%) will be used in November 2013 to assess the results of

the treatments. I think the use of RSG agreed to the length of the project because it allowed for detailed planning of the project and therefore a proper search for the purchase price of the equipment needed and anticipate contingencies. Given the characteristics of our project, we had to concentrate a lot of effort in a few months to take advantage of the flowering period of the palm.

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
Camcorder	1818,18	1560	258,18	We bought 2 full HD cameras Sony HDR-CX360VE because they cost more than budgeted (£ 606 vs £ 780). See attached images.
External memories for camcorder (32 GB)	90,91	88	2,91	
Ladder 10m	1113,64	860	253,64	We bought 2 ladders to 430 pounds because the price quoted was lower than the current price.
Fabrics for bags (in meters)	121,21	121	0,21	
Entomological's material (Entomological net, pins, drugs like ethyl acetate and preserves)	100	113	-13	See attached images.
Voice recorder	100	100	0	
Travel of members of the Group	1020	1000	20	The Dr. Lorena Ashword made two trips, Córdoba-Puerto Iguazu (round trip) for field work and Leopoldo Alvarez, one trip La Plata-Puerto Iguazú. See attached images.
Gasoline (Ltrs)	120,83	123	-2,17	
Field truck maintenance	150	150	0	We change oil, filters, repaired the brakes and bought a new car rubber for use as spare tire.
Salary field per working day (two assistances)	1363,64	980	383,64	Money destined for unforeseen expenses in the budget and to perform the last stage of fieldwork missing (wages + gasoline)
Transfer bank fees		512	-512	Finally I received £5488
Palmitera chair manufacturing (materials and labor)		-40	-40	Unforeseen expenses not covered by original budget required for carrying out the project

Safety harnesses (3)		-160	-160	Unforeseen expenses not covered by original budget required for carrying out the project
Other safety elements (ropes, Ratchet Strap, sheaves)		-38	-38	Unforeseen expenses not covered by original budget required for carrying out the project
Material for manufacturing camera mount		-32	-32	Unforeseen expenses not covered by original budget required for carrying out the project. The construction of the bracket was made by ourselves
Total	5998,41	5337	121,41	Available money destined for the final stage of the job still does performed (wages + gasoline)

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

I think we should begin to assess the role of pollinators in food production at both small family producers as medium to large producers. This should be done in different scenarios where the matrix is contemplated (vegetation and land use), and the structure of production units. This allows us to value the conservation of pollinators and their habitat as an alternative for the development of production systems more friendly to the environment. To do this, also should improve the management of stingless bee colonies to form in situ experiments.

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?

So far only have given to know the project by RSG link on the page of the foundation in which I participate. The logo was not used because the delay in starting the project but we estimate that it will be used for conferences, exhibitions and publications arising from this work, as us to go analysing the results.