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	Rodrigo Barbosa Gonçalves
Project title	Effects of forest fragmentation on communities and populations of wild bees (Hymenoptera, Apidae) in a rural landscape in western Paraná
RSG reference	10813-1
Reporting period	January 2012 – September 2013
Amount of grant	£5765
Your email address	goncalvesrb@gmail.com, rbg@ufpr.br
Date of this report	September 30th 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	The fieldwork (see attached images) was carried out between August 2012 and July 2013
Species identification		X		I am currently working on the proposal of morphospecies, and on species identification using taxonomical keys and comparison with museum deposited material
Data analysis of community structure		X		The proposed analysis depend on species identification
Molecular lab work - DNA isolation and sequencing and further population analysis	x			After examining species abundances along the study sites, I selected a target species (*Augochlorella ephyra*) for DNA analysis. The next step is to acquire the reagents and standardise the protocols for the molecular lab work
Data publication		X		Four regional congress abstracts were produced for divulgation of the project. Publications depend on the obtain the final results

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

The first difficulty was to deal with study site selection. In the original proposal I suggested 10 forest fragments but examining the area this number was reduced to five. This reduction was made in order to facilitate the installation of traps and replication of sampling effort improving the data quality over quantity.

The second difficulty was to start the DNA analysis. I consider that I have to select the species with high abundance along the sites to archive the proposed goals. So, the molecular study came as a second step in the project and demand an additional 1-year dedication for results.

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

The first outcome was to generate reliable data for analysis. Pan traps sampled a sum of 1344 bees distributed in 94 species all over the five study sites. The proportion of bee individuals and bee species sampled by trap unit in each area does not depart significantly from 0.58. Bait traps sampled 366 orchid bees, distributed in six species (see attached file Abstract Orchid bees – in Portuguese). As for pan traps the proportion of orchid bee by trap unit was significantly the same. I consider this preliminary result very interesting since it predicts that bee sampling by trap unit is almost the same in spite of the size of fragments. So, even small fragments are also maintaining the bees according to

their size. Other effects, as border or isolation, can be secondary if the final result be the same. Obviously, this interpretation is very preliminary and further analysis can give different insights.

The second outcome is the "secondary products" of the sampling. Two other hymenopteran taxa, Crabronidae and Pomplilidae, were sampled with high abundances among study sites: 358 crabronids and 155 spider wasps along the whole area (see attached file Abstract Wasps – in Portuguese). Each family has different lifestyles and peculiarities, and can provide reliable data for the same community level analysis carried out with bees to give different viewpoints of the fragmentation effects.

The third is the selection of target species for molecular study. Among orchid bees (bait trap sampling) the *Euglossa fimbriata* is the most abundant species, but other species also have high abundances. Among pan trapped bees, only *Augochlorella ephyra* has more than 10 sampled individuals in each area. It is expected that sweat bees have lesser flight ranges than orchid bees and can be better candidates to assert any relation of population structure and spacial patterns.

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, but I have to highlight that I can apply the generated data in my extension project "Knowing the Biodiversity of Palotina municipality" (registered at Paraná Federal University). This project involves other colleagues and it objectives to disseminate the results of the biodiversity research of our campus for the community of the municipality.

5. Are there any plans to continue this work?

In the future I have the interest to increase the geographical range and study bee assemblages in more isolate fragments. The final results of present project can be used to propose my new approaches in the study of fragmentation.

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

By publishing the results in international journals, and with society by applying the knowledge in aforementioned extension project**.**

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

The grant was mostly used before the start of field work. As received the money transfer in February, I can only begin sampling in the spring (September). I used the time to buy some items, the entomological drawers and cabinets, GPS, stereomicroscope, entomological pins, and traps. The second step (molecular study) will demand a time to buy the reagents. I think that length of project was very small in the original proposal.

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
Entomogical cabinets for entomological drawers – collection provisioning	487	487	0	See attached images
Entomological drawers for entomological boxes – collection provisioning	780	780	0	See attached images
Stereomicroscope for sorting and identification - entomology lab use	1867	1872	-5	Stereomicroscope Zeiss Stemi DV4, See attached images
Stove for pinned specimens drying - entomology lab use	498	560	-62	
Malaise traps for bee collecting - field use	579	579	0	Instead of Malaise traps, this project used pan traps and bait traps. The amount was applied to buy these other traps and compounds used to attract orchid bees (eucaliptol (Sigma-Aldrich)) as well fuel expendidures for the 12 sampling days
Insect Pins, Entomoravia - entomology lab use	333	310	23	
GPS for taking precise coordinates of the area - field use	551	154	397	I super estimate the price of GPS in the original proposal
Purification enzymes, ExoSap-IT – molecular lab use	168	-	168	The molecular step was not yet achieved
Mix to PCR reactions (DNTP + Taq) - molecular lab use	154	-	154	The molecular step was not yet achieved
Primers, CO1 and CytB, for sequence amplification molecular lab use	99	-	99	The molecular step was not yet achieved
DNA extraction Kit,DNeasy, Qiagen -molecular lab use	249	-	249	The molecular step was not yet achieved
Bank fees – amount transfer	-	557	-557	I received 5208 pounds due to bank fees of money transfer.
Total	5765	5299	466	I currently have 466 pounds in my bank account to buy molecular reagents. This amount will partially cover the cost of the step, and I will apply for complementation.

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

I have to continue the species identification and hence the analysis in a short period of time, also, as mentioned above, I will work in the molecular lab in this next year. After these efforts I can provide a report with final results and analysis, as well submit manuscripts for publication.

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?

Yes, I used the Rufford Foundation logo in congress banners, and acknowledged RF in the abstracts I produced. Also, I have mentioned Rufford Foundation in my homepage and will acknowledge in the future publications.