

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	Mr Scott Groom
Project title	Native bee conservation in Samoa: Assessing threats and developing strategies
RSG reference	8609-1
Reporting period	12 months
Amount of grant	£5989
Your email address	scott.groom@flinders.edu.au
Date of this report	21 st Sept 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
Baseline assessment of species diversity			X	Our first field trip was very successful, with broad coverage of recorded species and several new species. Both main islands were sampled extensively across a wide range of habitats. The enigmatic cleptoparasitic genus <i>Echthralictus</i> was also collected, allowing us to be the first to sequence this important lineage.
Molecular phylogenetic assessment of conservation priority		X Ongoing		Tissue samples of >200 specimens have been imaged and lodged for sequencing with the iBOL (International Barcoding of Life) facility. Morphological variability within one particular group is considerable, and quite likely represents a very recent dispersal and speciation-in-action event.
Build collaborative relationships and develop future projects		X Ongoing		Field work within Samoa was strongly supported by staff of the Ministry of Natural Resources and Environment, who expressed interest in continuing with further pollinator research to investigate roles in local agriculture.
Implement identification tools in local natural resource management		X Ongoing		High resolution imaging of specimens, one of the most time-consuming activities in producing field guides, has been completed and we have begun to develop a series of educational posters with the aid of the Secretariat for the Pacific Community. A photographic-based field guide will be outlined based on stakeholder requirements on our return to Samoa.

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

The greatest difficulty to overcome in our work in Samoa (and more generally for other project in the south west Pacific, has been overcoming local administrative impediments to projected time schedules. Processing of our research permit took far longer than we could have anticipated, and eventually this process could only be completed once I was in country and able to deal with officials in person. Sorting and tissue sampling of our collected specimens added to these delays because of the sheer volume of material that I collected, and the analysis of DNA sequences of these specimens

was therefore slower than anticipated. On the other hand, the large amount of material gained will allow a much more comprehensive basis for our research findings, indicating a larger and more complex bee biota than was thought. Because of these delays, and the necessity to have the first set of samples proceed through pre-analysis before the second round of sampling, our return to Samoa to obtain follow-up material and present the results of the study to stakeholders is planned for early 2013.

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

Three major outcomes of the project include:

- i) Collection of multiple specimens for multiple species of the proposed cleptoparasitic genus *Echthralictus*. This study will be the first to sequence DNA of the genus, which is the only recorded origin of this type of evolutionary strategy in the Pacific. Determining the position of the group within the topology of the *Lasioglossum* bee genus will provide invaluable insight into the origin and evolution social cheating strategies, especially in terms of how rapidly such strategies can evolve and how fragile they are to extinction.
- ii) Our collections highlight the huge morphological diversity in the *Lasioglossum* subgenus *Homalictus*. It fact our data suggest a very recent and rapid radiation, where we appear to be looking at speciation-in-action. Molecular phylogenetic analyses will confirm this for Samoa, but there is already evidence of a very recent (>200 000 years) origin for a related group in Fiji¹ that is almost certainly much older than the Samoan group. This is also the most abundant group in Samoa and, as a generalist pollinator, represents a highly viable substitute for the vulnerable honeybees relied on in agriculture.
- iii) A large proportion of our collection included representatives from the Apidae and Megachilidae families, and many of the species from these groups provide insight into the role of human colonisation on bee dispersals. Our study of the Megachilidae of Fiji², almost half of the known bee species for the archipelago, indicates they were almost entirely introduced within the time frame of human occupation of the Pacific. As they are wood boring bees, their dispersal would have been aided by maritime trade and we expect to find similar results in our analyses of Samoan Megachilidae. This has implications for biosecurity of the islands and how early pollination systems may have been disrupted by recent introductions. The conservation implications for Pacific Island indigenous plant/pollinator suites could be enormous

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

The Ministry of Natural Resources and Environment (MNRE) worked closely with us throughout our field work and sought to ensure our results were summarised on conclusion of the project. In particular, the assistance of Afele Faiilagi was invaluable. The very existence of native bee fauna in

¹ Groom SVC, Stevens MI, Schwarz MP (in review) 'Diversification of Fijian halictine bees: insights into a recent island radiation' *Molecular Phylogenetics & Evolution*

² Davies OK, Groom SVC, Ngo HT, Stevens MI, Schwarz MP (in review) 'Diversity and Origins of Fijian Leaf-cutter Bees (Megachilidae)' *Pacific Science*

many areas of the Pacific is not well known, so their involvement in the project was a priority for us. With their help we were able to approach villages where we could collect bees while also explain the importance for doing so. We hope to begin implementing programs to promote ways to increase local bee abundance in villages and ensure effective pollination of community fruit and nut crops.

5. Are there any plans to continue this work?

We plan to continue with this project with the aim of acquiring longer-term funding for studies focussed on native bees as pollinators of natural and agricultural systems. Due to the lack of research in this region, our study has provided the baseline assessment of bee diversity from which we can now build upon. Pollination as an ecosystem service is critical in island systems, but also incredibly vulnerable. The next phase of research will look to understand the role of native bees, and how to promote their preservation locally.

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

Results of our project will be submitted for publication in peer reviewed journals and presented to stakeholders in Samoa during a return trip for this purpose. Identifications tools are in the process of being developed and we will look to MNRE to assist us in implementing them in field use. The Secretariat for the Pacific Community will also be utilised to circulate outcomes to other areas of the Pacific that may implement similar management strategies.

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

The RSG has been used over a 12-month period from the start of the first field trip, however, several months prior to this were required to organise research permits. We expect the project to be finalised within 6 months, a total of 18 months, with DNA sequence analysis and presentation of our work to stakeholders remaining. Delays outlined in section 2 unfortunately extended the length of our original timeline.

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
Vehicle	758	722	+36	*Return trip early 2013
Accommodation	2647	556	+2091	*Return trip early 2013
Airfares	767	347	+420	*Return trip early 2013
Sequencing	1817	1209	+608	Awaiting invoice for sequencing of COI gene
Total	5989	2834	3155	

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

The next important steps will be to take what we know of the evolutionary histories of the Samoan bee groups, based on DNA sequencing and detailed sampling across habitats, and develop strategies to sustain and increase population sizes. Many of the species we looked at indicated very small distributions on relatively small islands, meaning their susceptibility to changes in land use, climate, etc is high. There is very little known of the life histories and nesting behaviours of these bees, which will prove essential if such strategies are to be implemented successfully. This will depend on the involvement of the local management authorities, which at this stage looks very promising.

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?

The results of our study are yet to be presented formally, however, the RSGF logo will be acknowledged for the trust's excellent financial support of this important project in all materials that we produce where logos can be included.

11. Any other comments?

Despite the extended timeline, we believe the results of the project will comprise the most thorough study of native bee faunas for a Pacific island group, providing the grounds for evidence-based pollinator conservation policy and serve as a template for other Pacific archipelagos.