

## The Rufford Foundation

### Final Report

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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](mailto:jane@rufford.org).

Thank you for your help.

**Josh Cole, Grants Director**

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Grant Recipient Details	
Your name	Ryan McAndrews
Project title	Vulnerability of two critical functions of Fijian coral reefs to fishing pressure
RSG reference	18231-1
Reporting period	September 2015 - 2016
Amount of grant	£5,000
Your email address	<a href="mailto:ryan.mcandrews@my.jcu.edu.au">ryan.mcandrews@my.jcu.edu.au</a>
Date of this report	26.09.2016

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
New trait-based classification of herbivorous reef fishes in relation to ecological function		X		This objective has been achieved for some (not yet all) of the sites. Further site inclusion will introduce new species to the classification, possibly new traits, and new environmental drivers. It is expected that this objective will be completed by the end of next year and contribute fully to 1 and partially to at least three scientific publications. The results obtained so far have already been presented at two international conferences (International Coral Reef Symposium - Honolulu and Estuarine and Coastal Shelf Sciences Association - Bremen) and written as a chapter in my MSc thesis.
Quantification of the impact of fishing pressure on species redundancy within both ecological functions of reversal and prevention		X		A larger than expected data set was obtained during fieldwork, and will take another year to fully analyse. This will be expected to contribute to at least one scientific publication and an international conference presentation. The information may also contribute to policy briefs and will be disseminated to relevant authorities and stakeholders in Fiji over the next year.
Quantification of the impact of locally-managed marine area (LMMA) protection on		X		This objective is closely linked with the previous one, see above comment.

species redundancy within both ecological functions of reversal and prevention				
Identification of major threats of reef fisheries to herbivorous fish populations		X		This objective is closely linked with the previous ones, see above comment.
Dissemination of results to relevant stakeholders	X			This will be achieved towards the latter half of next year through publication of the results in at least three peer-reviewed articles, policy briefs, dissemination of articles and summaries to local villages, NGOs, and national authorities alike. Two international conference presentations have already taken place on preliminary results, with at least one other planned for the next year. Additionally, copies of all material will be deposited in the library of the University of the South Pacific and communicated to the Fisheries Ministry and the Locally-Managed Marine Areas (LMMA) Network.

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

Upon arrival in Fiji, it became clear that the locally managed marine areas we had planned to investigate were of varying states of effectiveness. As a backup plan, we attempted to place our sites to not only allow comparison of reef areas within and outside LMMAs, but along environmental gradients (specifically, nutrient and sediment levels emanating from coastal villages). While quantifying and measuring sediment worked out quite well, nutrient measurements proved a bit more difficult.

Perhaps most importantly, and as a result of our short time to get to work, the sites chosen (based on visual observation of water movements and reef condition) did

not always prove to be along neat gradients of sediment characteristics or nutrient levels. While these variables were not central to my project *per se*, they are important in determining herbivorous fish foraging behaviour, which is what I was aiming to study. Although this was considered and realised at the time, in hindsight, we could have sampled *in situ* sediment at each of the sites to get an idea of terrestrial influence (although *a priori* nutrient analysis was not possible at the time). Luckily, this is not so much of a problem now that the data has been collected to allow quantification of dozens of variables relating to environmental variables and fish and benthic communities.

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

Although much of the data remains to be analysed, and any conclusions are thus tentative, a few important points have been revealed:

1. *The usefulness of a trait-based approach when looking at both ecological and social systems, particularly in regard to the interactions between them.* Fish provide functional roles within an ecosystem according to morphological, physiological, and behavioural traits at species, population, and individual levels. Furthermore, fishermen selectively target fish based on a different (and potentially overlapping) set of morphological and behavioural traits. Designing the experiments and surveys from the beginning to allow consideration of traits in isolation as well as a whole is proving extremely useful in shedding light on how different environmental or social aspects can impact fish communities, functioning, and indirectly ecosystem resilience.
2. *The consideration of terrestrial inputs, specifically fine, organic-rich sediments.* While the initial focus of the project was on the effectiveness of community-based fisheries management as well as nutrient inputs, sedimentation rates and sediment characteristics became apparent as drivers of benthic communities as well as herbivorous fish feeding activity. In some of the project's study areas, fine, organic-rich sediments contributed to the development of anoxic layers. These anoxic sediments have been shown in other areas to be severely detrimental to the benthic community, and only recently have their effects to fish behaviour been demonstrated. Ultimately, the clearing of mangroves and catchment land for agriculture contributes excessive fine and organic-rich sediments, which allow development of anoxia in nearshore areas.
3. *The consideration of local ecological knowledge and seeing fisheries resources from the perspectives of local resource users.* Along the lines of the

trait-based approach mentioned in the first point, the knowledge of the local people and fishermen appeared to follow a trait-based pattern. The names of fishes in Fijian did not necessarily correspond to Western-based taxonomy or phylogeny. Rather, fish names corresponded to colour patterns, maximum lengths, general body shape, and preferred means of cooking the fish. This understanding went further, where some fishes were targeted based on behaviour that can differ from other species. The preference and consequent vulnerability of certain species to fishing pressure depends upon often multiple reasons for a fisherman to go fishing. This aspect of the project is perhaps the most preliminary, with much of the data yet to be analysed. The depth of local understanding of the ecosystems and fishes combined with the discrepancies with western-style knowledge could have important implications for the efficacy of different management styles.

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

There were eight villages (on four islands) directly involved in the site selection, study design, and data collection for this project. All eight were initially curious to hear about our project and proposal to work with them. After introducing ourselves and projects following traditional customs and involving the regional and local chiefs, the local communities all expressed a keen interest in being involved in the project implementation as well as in the discussion of the findings. All diving work was done using local boats, captains, and assistants, and in most of the villages, the work and findings of the day were discussed directly with the local community each night. Additionally, catch interviews, questionnaires, and relevant catch surveys were not possible without the help and guidance of local community members. Coding, processing, and analysis of the data is still very much ongoing. Once available, we will get in touch with local communities and institutions (e.g. Ministry of Fisheries, the Locally-Managed Marine Areas Network, Wildlife Conservation Society, etc.) as discuss together the relevance and meaning of what we find. Ultimately, this collaborative process would aim to improve not only the understanding of local communities' resources and possible impacts of their livelihoods, but better inform other stakeholders (including management) of the detailed importance and perspectives that local peoples have for the inshore fisheries. Basically, this project aims to facilitate informed collaborative dialogue between local resource owners and users, management, and NGOs.

**5. Are there any plans to continue this work?**

Absolutely. As has been mentioned, this work is very much ongoing at the moment. Future plans include the collaborative (between project members, local communities, fisheries managers, and NGOs) production of scientific papers, policy briefs, popular articles, conference presentations, and general dissemination and discussion of the results. This project integrates well within the parent REPICORE project, connecting importance of fishes to ecosystem functioning as well as fisheries, which can provide direct links to other component projects under the REPICORE umbrella as well as other research in the South Pacific.

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

The results will be shared directly through discussion (face-to-face meetings when possible, Skype or telephone otherwise) after dissemination of the project results. Discussion with key stakeholders will then illuminate a direction to be taken in scientific papers and policy briefs to allow exposure to and use of this project's findings to the global scientific and managerial community.

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

The grant was received in September 2015 and spending began immediately, ending with the conclusion of fieldwork in February 2016. This was 1-2 months longer than the originally anticipated length of the fieldwork component. Although the Rufford funding was only obtained and spent on fieldwork, the project will continue on over the next year or longer.

**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
Suva accommodation	£1,163	£1,163	0	

Village accommodation	£391	£391	0	
Germany-Fiji return flights	£654	£1,080	+£426	The entire cost of flights was spent in exchange for external funding covering SCUBA gear and the eventual non-necessity of a 3D GoPro housing.
SCUBA gear	£296	0	-£296	To flights (see above)
SCUBA tank rental, filling	£255	£255	0	SCUBA tank fills and rental were paid by external funding. Instead, this money was re-allocated to local transportation and eventual shipping of dissemination materials back to Fiji.
Fijian interpreter	£186	£186	0	
Phone, internet access	£93	£153	+£60	Phone credit and internet access were more expensive than expected. Funding re-allocated from backup devices once external funding was secured for them.
Data backup devices	£60	0	-£60	To phone, internet (see above)
Waterproof bag, mosquito netting, sleeping bag	£116	£116	0	
GoPro Hero 3s	£1,080	£1,080	0	
GoPro BacPac batteries, SD cards	£576	£576	0	
3D GoPro housing	£130	0	-£130	To flights (see above)
<b>TOTAL</b>	£5,000	£5,000	0	

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

As previously mentioned, the next steps will consist of continuing to analyse the data obtained during fieldwork and compare to and discuss with other REPICORE component project researchers. Then through collaborative discussion with local



communities and other stakeholders, scientific papers will be produced, likely followed by policy briefs.

**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 Rufford Foundation logo was used in all of my presentations at my home institute and university. Additionally, it is within my MSc thesis, and was included in presentations at the 13<sup>th</sup> International Coral Reef Symposium (June 2016 in Honolulu, Hawaii), ECSA (Estuarine Coastal and Shelf Sciences) 56 (September 2016 in Bremen, Germany), and YOUMARES (September 2016 in Hamburg, Germany) Conferences.

**11. Any other comments?**

The funding provided by the Rufford Foundation for my project substantially increased the scope and depth of data collected during fieldwork. This was made particularly less stressful and less complicated by the direct transfer of funds to my personal account. While I am sure that there are very logical reasons for why the RSGF does not contribute funds for conference presentations, I feel that this could greatly contribute to the exposure of the project to the worldwide scientific and managerial community as well as increasing the exposure of the RSGF.