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	Sheila M. Walsh & Julia K. Baum
Project title	Conservation and Sustainable Development of Coral Reef Ecosystems on Kiritimati Atoll, Republic of Kiribati
RSG reference	68.05.09
Reporting period	July – August 2009
Amount of grant	£5900
Your email address	walsh.sheilamarie@gmail.com, juliakbaum@gmail.com
Date of this report	October 28, 2009

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
1. Conduct underwater visual censuses of fish and benthos at 34 sites around the atoll.		✓		We conducted surveys at 31 of 34 targeted sites. A few sites on the remote southern side of the atoll were inaccessible because of strong swells from southern ocean storms.
2. Establish permanent mega-photoquadrats at a subset of sites to monitor coral dynamics			✓	We established and photographed 10 4x4m mega-photoquadrats around the atoll.
3. Conduct socioeconomic surveys in all 4 villages			✓	We conducted a total of 152 household surveys in all 4 of the villages (London, 49; Tabwakea, 56; Banana, 35; Poland 12).
4. Develop a coupled ecological-socioeconomic model to serve as a decision tool and form basis for long-term adaptive management planning		✓ (not yet achieved, but in progress)		We obtained information on relevant alternative conservation-development scenarios through a consultation with the Permanent Secretary of the Ministry of Line and Phoenix Islands. We are currently working on the model development. We plan to have initial scenario projections by Spring 2010. At this time, we will submit the scenarios and model assumptions to the Permanent Secretary for commentary. We will revise the model based on this review and have final outputs by the beginning of Summer 2010. We will continue to develop and apply this model with new data each year.

In addition to these original objectives, we also carried out the following work while there:

- Consultations with officials from the Ministry of Fisheries, Kiritimati Island Council, and the Resource Economist and Permanent Secretary for the Ministry of the Line and Phoenix Islands;
- Conducted focused interviews with all shark fin exporters on the island and obtained data on each firm in order to complete a cost-benefit analysis of the industry;
- Implemented urchin surveys at 15 sites around the atoll.

This objective was motivated by the observation of extremely high numbers of urchins at the most degraded reef sites. Urchins were rarely seen in 2007.

- Installed coral settlement tiles on each megaphotoquadrat.
  We deployed coral settlement tiles (6"x6") on the corners of each of the photoquadrats (n=60 total). Two corners had single tiles and two corners had double tiles to test for effects of open surfaces and crevices (created between the double tiles) on coral settlement. These will be sampled in 2010.
- Conducted an herbivore grazing experiment under high and low background fishing pressure.
  We first piloted the experiment at two sites, and gained valuable knowledge about algal care from this deployment. We then proceeded with the full experiment. Three sites were chosen for each fishing treatment based on fish catch data from household surveys conducted in 2007. At each site, there were six independent replicates of the experiment. At each replicate, pre-weighed samples of seven types (turf, *Lobophora*, *Halimeda* (2 spp.), *Padina*, *Ulva*, *Caluerpa*) of algae were deployed in paired caged and exposed treatments. The treatments were retrieved after four days. We are currently doing post-processing of the samples, and starting the data analysis.
- Collected algal samples for biomass estimates
  Four to six samples of three major algal types (*Halimeda*, turf, and *Lobophora*) were collected from sites within and outside the upwelling region to provide biomass-area relationships. Some samples still need to be processed.
- Collected water samples for chlorophyll α analysis
  Three samples were collected from the surface waters and water near to the reef at all experiment sites and additional sites outside the upwelling zone to ground-truth satellite derived chlorophyll α data and provide estimates of productivity. These samples are currently being processed.
- Purchased fish from aquarium collectors to begin a stable isotope study.
- Collaborated with Radio Kiritimati to record educational video voice-over in Kiribati language

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

Although we had previous experience of shipping gear to Kiritimati, the reduced shipping options combined with the additional gear that was needed for this project made shipping very challenging. For instance, some gear was delayed in arriving within the United States and had to be shipped on a cargo plane that arrived part way through our time on Kiritimati. Although we did manage to get all of our gear and it did not limit our efforts, we would aim to place orders and make shipments earlier.

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

1. Socioeconomic
We collected a second round of household survey data that will allow us to look at effects of the population re-settlement programme and reductions in tourism. These data will also provide important inputs into the coupled ecological-economic model we are developing in order to make scenario projections for conservation and development.

2. Ecological surveys

We collected a second round of ecological survey data (fish and benthic community data) that is uniquely linked to the spatial and temporal scale of the household survey data. Now, we will be able to compare coupled changes across time and space to assess the validity of space-for-time approaches and establish causality for changes in ecosystem health and welfare.

3. Ecological monitoring
We established permanent mega-photoquadrats and coral settlement tiles that will allow us to track changes in growth, death, and recruitment of individual organisms in the benthic community in response to environmental and human impacts. These data will provide unique insights into mechanisms of change that cannot be obtained from repeated small benthic photoquadrats.

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

By conducting the household surveys with the Ministry of Fisheries, we achieved a shared goal of assessing artisanal fishing and extended this goal to a broader assessment of socioeconomic activities and welfare. The Ministry of Fisheries benefited from Sheila Walsh's management of the survey, and fisheries officers gained additional experience in enumeration and survey implementation. In addition, the Ministry of Fisheries and the local community will benefit from the analyses of the survey data being conducted by Sheila Walsh that extend beyond the analyses typically conducted by the Ministry of Fisheries for artisanal fishing survey data.

Local aquarium fish collectors benefited from the additional profits generated by supplying fish samples for stable isotope analysis. We expect that they also benefited from the shared learning experience we had discussing our own perceptions of changes in reef health and the effects of changes their ability to export fish due to the smaller plane size.

The local dive operator and his employees benefited from additional profits generated through providing dive services and lodging to our research team. Again, we expect that they also benefited, as we did, from discussions of our knowledge and perceptions of changes in reef health.

The local community benefited from an informational interview conducted with Sheila Walsh on Radio Kiritimati. Sheila described the lessons learned about changes in reef health, human welfare, and alternative incomes from her previous research. She also discussed the basic linkages between reef health and human welfare and the observations the research team and people in the local community had made. She also provided an overview of the research programme and the need for community support and engagement in long-term adaptive management.

In addition, the local community will benefit from an educational video about changes in reef health and the potential of marine reserves in Kiritimati. The film was produced by Soames Summerhayes (America's Ocean Challenge) with scientific advising from Sheila Walsh and Stuart Sandin (Scripps Institution of Oceanography). Sheila obtained the assistance of Radio Kiritimati in recording a voice-over in the Kiribati language. Sheila is currently pursuing additional funding to make final productions of the film and distribute them.

The permanent Secretary of the Ministry of Line and Phoenix Islands expressed a strong need for assistance in planning for conservation and development. By working together on reasonable

scenario projections, we believe we can provide important information and tools to the Secretary and other policy makers.

5. Are there any plans to continue this work?

Yes, we plan on going back to Kiritimati each year. Our broad plan is to alternate our foci between years, conducting socioeconomic and ecological surveys every second year, targeted ecological studies and experiments and community engagement programmes in alternate years. Next year, we plan to re-survey existing permanent photoquadrats and establish additional photoquadrats to improve statistical power, and expand our stable isotope study of the food web. In addition, we will conduct public goods experiments and marine resource use mapping exercises to assess challenges to cooperation and simulate/initiate the process of marine reserve design. We will use the educational film that was completed this year to introduce these exercises and to test for the effect of information on cooperation in the public goods experiments. Following the experiments and exercises, we will show the film during presentations at churches and schools. Lastly, we will consult with the Ministry of Line and Phoenix Islands on how to achieve conservation-development goals identified by our model projections.

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

We will share our results with the government of the Republic of Kiribati by sending reports to the Ministry of Fisheries, Ministry of Environment Land and Development, Ministry of Line and Phoenix Islands, and Kiritimati Island Council. We will have a summary of the report published in the quarterly Ministry of Fisheries newsletter (this was also done in 2009). We would like to arrange an interview on Radio Kiritimati or a weekly series during our field work in 2010. As noted above, we will make presentations at churches and schools. Lastly, we will communicate our results to the academic community by publishing in the peer reviewed literature and presenting at conferences.

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

We used the RSG over our four-week trip to Kiritimati in July and August 2009, during which time we worked with two translators/research assistants from Kiritimati, two boat captains from Kiritimati, and with four research assistants from the U.S. and Australia. The actual length of the field trip is the length that we anticipated. However, we are continuing to analyze data and prepare reports and publications using our post-doctoral salaries for support.

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
Flights (San Diego – Honolulu – Kiritimati return)	£3053.38	£2780.15	- £273.23	Flights were actually more expensive than we had budgeted, but we used a 2nd funding source to pay for the rest.
Lodging in Honolulu (before and after	£115.35	£115.47	+ £0.12	-

Kiritimati trip)				
Lodging and Food on Kiritimati	£1412.99	£1216.56	- £196.43	We moved to different lodging for the last two weeks because it was slightly cheaper.
Socioeconomic survey: salary for enumerators	£814.23	£288.82	-£525.41	The Ministry of Fisheries covered the costs for the socioeconomic translators, so we only had to pay for their overtime.
Socioeconomic survey: transportation	£164.88	£265.83	+£100.95	
Socioeconomic survey: supplies	£67.85	£64.93	-£2.92	-
Shipping	£271.41	£185.15	-£92.58	Shipping costs were actually more expensive than we had budgeted, but we used a 2nd funding source to pay for the rest.
Permits and visas (work permit, research permit, exit tax)	£0	£150.05	£150.05	We had put these in the budget proposal for our Project AWARE grant, but we only received partial funding from this organization.
Diving (boat & tanks)	£0	£833.02	+£833.02	We have used the savings from other budgeted items to pay for some of the diving costs we incurred, because the Project AWARE grant we received (US$800) could not cover all of them.
Total	£5900	£5900.01	We have used the exchange rate from when our grant (£5900) was deposited in my US account: US$1 = £0.62774238	

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

The important next steps are to determine what conservation-development policies might be recommended from the results of our analyses and to communicate these to the Permanent Secretary. Next summer, we would want to evaluate the feasibility of such policies (e.g. marine reserves) and engage the community in implementation. Successful community engagement would also involve communicating our results and recommendations through the radio and church and school presentations. We also want to bring the socioeconomic and ecological monitoring to full scale and make it sustainable in the long-run by establishing additional permanent photoquadrats and building the capacity within the Ministry of Fisheries to conduct surveys.

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?

We have not yet used the logo; however, we expect that we will use the logo in conference presentations, reports, and community outreach materials. We have also made a number of our colleagues aware of the Rufford Small Grants.

11. Any other comments?

We are grateful for Rufford's support of our conservation research on Kiritimati, and are looking forward to continuing this work next year.