

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	Erwan Sola
Project title	Reproductive synchrony and recruitment ecology of scleractinian corals at Vamizi Island, northern Mozambique
RSG reference	14321-1
Reporting period	2015-2016
Amount of grant	£4963
Your email address	erwan.sola@gmail.com
Date of this report	01/06/2016

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
To refine our understanding of reproductive synchrony within the <i>Acropora</i> genus, but also for other taxa (i.e. proportion of species and of colonies spawning)				Our investigation of two additional mass-spawning events in Vamizi gave us a better understanding of synchrony between and within species. Using marked colony made clear the differences across species which are thus likely to react differently to disturbance during the reproductive peak.
To elucidate inter-annual variability of timing and quantity of spawning as well as the environmental factors that influence them				Our additional observation of spawning events had help understand the timing of spawning. Maturation and release of gametes occurred during the wind shift period, on the neap tide following gamete maturation, usually in September.
To add to data on the level of larval recruitment on Vamizi reefs and help identify areas of higher settlement rates and thus higher resilience potential, providing a multi-year data set				We were able to expand our dataset of recruitment rates around Vamizi, however, it will be of great benefit to science and management to expand our knowledge by including more sampling station around Vamizi and other islands of the area.
To use techniques of fluorescence photography, to establish a novel method of measuring larval mortality in the earliest stage of post-settlement phase, which is recognised as the most critical for actual recruitment of juveniles to the population, yet the most difficult to study				Our trial experiments with fluorescence photography revealed caveats in this technique. Not all small larvae fluoresce enough and some may be hidden in the complex topography of the reef, which is a problem given the 2D nature of the photographs. Consequently, larvae may not be accountable with precision and the method had to be abandoned
To elucidate the timing of coral reproduction and level of reproductive synchrony in adjacent				This was based on a single sampling trip due to the distance of travel; however, it showed that in that year of the experiment, the island north of

islands and determine patterns of population connectivity between these and Vamizi by estimating larval drift.				Vamizi (Rongui) also had a similar proportion of corals ready to spawn in synchrony, while this was not the case for Metundo Island at south. Given the greater proximity of Rongui to the future site of mining and LNG construction, it warrants greater attention to this island which is at greater risk of disturbance from the mining industry.
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

Among the main difficulties of project logistics concerned the schedules of transport on and off the island. We were not always in control of arrival and departure dates which resulted in spending sometimes longer period's on-island than previously expected. However, we were able to rearrange the workload to make use of all the time spent on-island. In addition, the cost of airfares was less than budgeted and we were able to use those funds to cover the extra accommodation fees that incurred.

During the drifter's experiments, we experienced some difficulties with sea conditions and human interaction. In one occasion, two units got stranded on a small nearby island and weather prevented retrieval for 3 days. Despite our community consultations, some drifters eventually got picked-up by curious fishermen and brought back to land. In all instances, however, GPS tracking and good relation with communities of the surrounding and the help of the CCP, all drifters were always retrieved safely with only minor interference in the study.

While we wish to ascend our finding to relevant stakeholders in the mining operation, namely Anadarko and ENI, and government, we could not establish an official contact. The political and economical situation in the country is such that a standby is imposed to the mining operation. Exploration and groundwork operation are completed but not go ahead is yet given. Stakeholders may shift in this process and so little dialogue has occurred recently with the industry. We hope to see appropriate channels of communication reopen in due time, so our findings can have a greater impact on the field.

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

- We were able to establish a simple working sampling protocol that is effective in detecting upcoming spawning events in Vamizi and train the staff of the Marine Conservation Research Centre in performing it. The staff also acquired the methods to deploy, retrieve and process settlement plates for the monitoring of larval settlement. They currently wish to pursue the monitoring activities to maintain a long-term understanding of coral reproductive dynamics and health around the island.
- Combining our improved knowledge of the coral spawning timing and the data obtained from the drifters experiment we made one of our main findings, which

has important implications for management and conservation of coral reefs in the area, especially in the context of the mining industry soon to develop in the Quirimbas Archipelago. The data suggest that synchronous spawning occurring at the calmest period of the year and month is likely to result in high larval production and retention near Vamizi and immediate surroundings, especially given the configuration of the coast. Waters is retained within the system long enough for larvae to develop and settle. This means that these reefs (Vamizi and adjacent islands) are likely to: (1) have high reproductive success, (2) be self-reliant for larval input, and (3) be sensitive to disturbance such a pollution which would also be retained in the area, at the time of spawning and in general. This warrants special attention when managing these reefs and we are now in a better position to inform good practice.

- All the quantitative data obtain during the period of this project in regards to gamete maturation, spawning synchrony and larval settlement built up on a time series which provides a solid baseline of coral reproductive dynamics in the area prior to mining. This will not only allow stake holders in the industry and management sectors to plan the mining activity more carefully but also allow monitoring and measuring possible impacts the future offshore mining operation may ensue. This is vital since data deficiency is often a barrier to effective management and conservation of living resources.

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

Members of the community who are employed at the Marine Conservation Research Centre were directly involved in the fieldwork providing support for all tasks from skipping to diving to setting up the equipment and processing the samples. They acquired all skills necessary to support the head conservation manager to perform the sampling protocol.

The local community fishing council (CCP) was regularly kept updated with all the activities performed during meetings. Explanations on the work and its importance were constantly provided and some members of the CCP had a chance to observe some of the activities and samples or equipment from the project to get better acquainted with scientific and monitoring techniques.

Prior to the drifters experiment, all communities of the island were consulted in public meetings (in addition to the CCP) and were explained about the nature of the project and ask not to interfere with the drifters if seen in the water. Compliance was generally good though the information may have missed some individual fisherman whom, out of curiosity, did temper with some of the drifters. In this case, friendly relation always allowed to retrieve the drifters in good conditions and was an opportunity for further explanations on the project.

Two seminars on the work conducted in Vamizi were given at the Universidade do Lurio in Pemba (Unilurio). The audience comprised all years of the Biological Science course. This was a great opportunity to communicate our work and to expose the future local scientist community to sensitive matters around coral reef conservation.

Talk on the nature and importance of the work performed was also offered to guests of the Vamizi Island Resort on multiple occasion.

5. Are there any plans to continue this work?

Yes.

Improved spatial sampling around Vamizi Island and surrounding islands is needed to consolidate our previous finding. Namely, the baseline measure of larval settlement and island closer to the future site of the LNG plant is crucial.

Further training of the Marine Conservation Research Centre staff to sample and data analysis would also be a positive outcome as they would gain total independence from scientifically skilled personnel for the entire monitoring program.

Students from the UniLurio marine programme could also benefit from training so they can collaborate more easily with the Marine Conservation Research Centre and provide academic support where needed, either for field work, funds, equipment or sample and data analysis. Workshops at the university and on the field either in Pemba or Vamizi would helps greatly towards this goal.

Elements from the local community could also benefit from training in fieldwork to increase the sampling force in different projects.

More awareness should be raised within the communities about the importance of corals.

Given that coral reefs off Rongui and Tecomagi islands may suffer physical damage during the construction of a pipeline from the offshore gas fields to the on-land LNG plant, it would be conceivable to experiment on coral culturing and stocking in Vamizi. Such a source stock could provide material in case there is a need for reef restoration on these nearby islands. Such pilot project is simple and cost-effective to implement and could involve member of local communities, eventually on a paid basis.

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

The data that remains to be analysed will generate manuscripts to be submitted to peer reviewed scientific journals for publication. Conferences will also be an opportunity to communicate the results. We also plan to produce a synthesis of these publications for none-scientific sources to reach the general audience.

A short report with recommendations addressed to relevant governmental authorities and stakeholders of the mining sector is under preparation and will be distributed, provided that appropriate channels of communication can be re-established.

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 used over 1 year from January 2015 to January 2016. This was the original timescale projected for grant use.

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
Travel (Maputo-Pemba)	2197	1468	729	The original budgeted airfare cost was calculated at for peak period and not all flights were made in this period so the actual cost was lower than budgeted and these funds were used for the extra accommodation costs.
Travel (Pemba-Vamizi)	415	0	415	The island management actually levied the Pemba-Vamizi island transfer after the project start. This unexpected saving allow covering the extra accommodation costs and one extra drifter.
Travel (South Africa-Mozambique)	273	270	3	
Accommodation + meals on-island	1039	2020	-981	Less flexibility than expected regarding island transfer made that about twice the amount of time on-island had to be spent during most trips.
Boat fuel	594	550	44	
Drifters	334	555	221	Since funds had been saved elsewhere in the budget, material to build one extra drifters was purchased
Consumable	111	99.12	12	
Total	4963	4963	0	

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

We believe it is important to extend our knowledge of coral reproductive dynamics in the entire Quirimbas Archipelagos. These are indeed the most diverse and extensive coral reef of the country and thus the most precious. This type of knowledge is important management and conservation tool.

Further training and collaboration with the Vamizi Marine Conservation Research Centre would be greatly beneficial for the conservation of Vamizi corals. This project has demonstrated an ease to transfer knowledge to this group and proved them to be a valuable support on the field. The existence of this centre and associated resources, both human and material, is of key importance for research and conservation work done in Vamizi and we recommend that their capacity continue to be built through such projects.

Again the position of Vamizi research centre and its ties to UniLurio also provides a good opportunity to offer training in field work for graduate students and we think it worthwhile to invest in projects that incorporate local student components.

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?

The Rufford Foundation Logo was used on a poster and PowerPoint presented at the 9th Scientific Symposium of the WIOMSA (Western Indian Ocean Marine Science Association),

RSG received publicity during the project mainly in the form of mouth-to-ear communication. It will also be acknowledged in the publication to emerge from this project.

11. Any other comments?

With unavoidable ups and downs, this project has been a great human and scientific experience and a general success.

Right: Drifter's tracks

