

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	Chee Su Yin
Project title	Eco-engineering: Design with nature
RSG reference	18071-1
Reporting period	12 months
Amount of grant	£5000
Your email address	suyinchee@usm.my / suyinchee@gmail.com
Date of this report	15.8.2016

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 determine if drill-cored tidal pools support greater species richness than adjacent rock surfaces on rock revetments.			X	The drill-cored tidal pools supported greater species richness than adjacent rock surfaces on the rock revetments.
To determine if deeper (12 cm) drill-cored tidal pools would support greater species richness than, and different community structure to shallower (5 cm) ones.			X	The depth of drill-cored tidal pools did not affect richness or community structure.
To determine if drill-cored tidal pools would support equivalent species richness and community structure to natural rock pools on the rock revetments.			X	The drill-cored tidal pools supported lesser species richness and different community compositions to natural rock pools on the rock revetments.

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

During the first few months of the project, some of the shallower drill-cored tidal pools totally dried up. This period coincided with the strongest El Nino ever recorded in the country suggesting that the high temperatures had increased evaporation rates in these pools. The final two months of the 8-month monitoring revealed an opposite scenario. This period in fact the beginning of the La Nina phenomenon in

Malaysia. These 2 months saw uncharacteristically high tidal levels and short exposure periods. This led to the difficulty in obtaining readings of the abiotic factors and counts of the organisms in the tidal pools. We thought it was very interesting to see the effects of El Nino and La Nina on the drill-cored tidal pools and decided that we will continue to monitor the pools for another 4 months to get a full set of data.

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

i) This project is the first eco-engineering project ever to be carried out in Malaysia. It is hoped that this project will be exemplary, open new avenues and create new ideas for everyone who utilises the coast. It also challenges the acceptance of the paradigm shift where instead of artificial structures being bare and species depauperate, can be designed in a manner that will meet societal needs, constraints of engineering and costs and which will also have less impact and/or provide improved habitats for species other than humankind.

ii) This project proved that ecologically engineered structures and improve the species richness on species depauperate rock revetments. The drill-cored tidal pools seem to serve as green lungs on barren rock holding green and brown algae. Adult and juvenile gastropods were observed in these pools suggesting that the pools provided shelter, breeding space and food for these organisms. Moulded shells of crabs were found at least three times suggesting that the pools may have been hide-outs for the crabs to moult. Many eggs of neritids were also found on the vertical sides of these pools. Other organisms found in abundance were shrimps, polychaetes, and barnacles. Occasionally, sea slugs and juvenile fish.

iii) This project also created a platform for me to project eco-engineering as one of the more feasible avenues in mitigating the effects of land reclamation. It was from this project that developers saw its potential and are now co-funding other methods together with my institution and other strategic partners.

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

Not relevant at the moment as this pilot project was done in a small scale as proof-of-concept but this paves the way for larger scale eco-engineering projects which have components that include local communities.

5. Are there any plans to continue this work?

Yes. Currently, we are extending the monitoring of this project for another 4 months. Variants of this project using different methods (e.g. flowerpots as tidal

pools) to encourage species colonisation and conservation on man-made shoreline structures (e.g. breakwaters and seawalls) are being initiated.

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

Through the publication of journals which will be written together with UK counterparts who carried out the same project in UK. Findings from this study will also be added to a handbook which will be put together once other methods have been tested out. Recently, my eco-engineering projects have also been highlighted in the media increasing public awareness on eco-engineering.

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

Over a 12 month period starting on the 1st of September 2015. The project can ideally be completed in 1.5 years.

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
Drilling contractors	2000.00	1901.16	98.84	
Thermocouple	200.00	199.80	0.20	
Contour gauge	100.00	94.26	5.74	
I-buttons	400.00	1350.37	-950.37	Price of I-buttons was underestimated. Item price also increased after the implementation of tax system in 2015. We recovered the budget when stakeholder agreed to fund the meeting and borrowed books from the library instead of buying field guides.
Mileage	70.00	70.00	=	
Stakeholder meeting	750.00	0.00	750.00	Covered by stakeholder
DO meter	300.00	309.83	-9.83	Recovered from savings from purchase of other

				items.
GPS	180.00	172.13	7.87	
Waterproof digital camera	250.00	245.90	4.10	
Field guides	150.00	0.00	150.00	Used field guides borrowed from the library
Software PRIMER	600.00	598.50	1.50	
<i>*Service Tax charged by Universiti Sains Malaysia to process international grants</i>	-	125.13	-125.13	Recovered from savings from purchase of other items.
Total	5000.00	5067.08	-67.08	Balance was paid out of pocket.

Local exchange rate: £1 = MYR 6.10

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

The next step is to trial as many methods as possible in order to determine what works in the tropical context and more importantly, for Penang Island. Soft, hard, hybrid and ideally, ecosystem-based approaches will be trialled to achieve a more sustainable and cost effective way of mitigating the coastal reclamation effects which arise from increasing development activities on the island. It will also be important to conduct fundamental research to explore potential ecosystem engineers (e.g. oyster or corals which build reefs) in Penang which can be utilised in ecosystem-based approaches.

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. The Rufford logo was used in my presentations to the coastal developers, the Penang state government, academic institutions, and in conferences.

11. Any other comments?

This grant was the very first grant I obtained after I decided to change my research field. I am very grateful to The Rufford Foundation for seeing beyond my past research and focusing on the significance of my current project and the potential it possesses in safeguarding the natural coastal ecosystems of Penang Island.