

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	Wei-Khang Heng
Project title	Mapping Dugong Habitat and Understanding Dugong Feeding Preferences in Sibutu Archipelago, Johor, Malaysia - Towards Critical Habitat Protection.
RSG reference	21732-1
Reporting period	4 th May 2017 – 31 st December 2018 (Extended)
Amount of grant	£ 5,000
Your email address	hengweikhang@gmail.com
Date of this report	15 th November 2018

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 identify the extent of seagrass meadows in the study site				Three seasons covering 2016 and 2017 yielded approximately 12,000 geographical points of underwater habitat (method: underwater towed video survey) of Sibiu Island to map its seagrass meadow. We obtained the coverage area of the seagrass meadow, and an ongoing spatial analysis will provide a very first spatially-explicit dugong habitat map of the island. This map will be served as a reference for future monitoring and place into the national seagrass inventory.
To identify main areas of dugong grazing				Dugong Feeding Hotspot Areas (FHAs) were identified within the foraging grounds in Sibiu Island (obtained from the first objective). The FHA overlapped across two seasons in 2016 showed there are favourite foraging grounds for dugongs. We are checking on the persistence of FHA by throughout more season.
To ascertain the factors that contributed to the primary feeding selection of dugongs in terms of diversity of species and biomass of seagrass consumed				Underwater feeding trail surveys were carried out to determine the factors (seagrass quantity and/or nutritional value) that driving dugong feeding preferences. This part was the most time-consuming, hard laboured and expensive portion of the whole project. Nonetheless, we managed to collect sufficient amount of seagrass and sediment samples in four sampling trips, to determine their nutritional values.
To determine the relationship of nutrient composition values of seagrass consumed with their diet preferences				
To determine the time-area usage patterns of those feeding grounds				A prototype Underwater Monitoring System for Dugongs (UMS-D) was developed and deployed in FHA

			<p>(identified from the second objective). The design and assembling process took us a long time due to trial and error to produce the best fit setup for an underwater camera system which can record long hours for animal habitat use study.</p> <p>We managed to capture two sightings of dugong feeding throughout the three surveys that we can make before the monsoon season this year.</p>
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

Towards achieving our fifth objective, we took a longer period than expected to fully develop the Underwater Video Monitoring System. As no one ever developed an underwater monitoring system specifically for dugong in a turbid environment before, we were trying to obtain both technologically sound and economically affordable scientific configuration in order to make sure this system is reproducible for future research and monitoring at a local level. Unfortunately, our progress encountered some challenges, such as battery life issues, quality of the first motherboard to support two HD cameras, and inability to conduct field trials due to the long period of rainy monsoon season. However, after several improvements and updating effort, the system has produced gratifying results in achieving our objective.

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

- a) **Seagrass and dugong feeding map:** We have obtained spatially detailed seagrass extent for Sibu Island, which is mapped for the first time. Feeding trail occurrence locations revealed feeding hotspot areas which explained a non-random (strategic) feeding behaviour of dugongs in this feeding ground. This information enabled us to properly develop management plans that will serve to protect the population's core habitat areas.
- b) **Factor(s) driving dugong feeding preference:** We have elucidated some significant relationships between the vegetative quality and quality with dugong feeding preferences, and site preference for feeding may presumably be influenced by the density, biomass, and nitrogen content of the seagrass community as a whole, instead of individual species. From these findings we are able to highlight the profile of seagrass as an important food source in the ecosystem which supports the survival of dugongs.
- c) **Direct evidence of dugong feeding:** We have obtained unprecedented proof of dugong feeding consecutively for 2 days at the same spot of seagrass

meadow as well as a noon-time feeding behaviour which is a useful information to support our earlier findings and to be accounted in the adaptive conservation and management efforts.

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

With the help of Reef Check Malaysia, we recruited three local islanders from Sibu Island to volunteer as field assistants for both seagrass and feeding trail mapping survey (boat-based) and feeding trail sampling (diving) in three different trips. We hoped to train them as part of the local youth team who will become the ambassadors to promote scientific monitoring work to their friends and family in conjunction with the ongoing management plan of Dugong Sanctuary (a marine protected area).

We always stayed in either Tinggi or Sibu Island and chartered research boat and diving facilities from the same local villagers who are running a small-scale homestay and dive shop. Along with the business we offered to them, we managed to build a strong relationship with the owners, boat skippers, workers, school teachers and students who are from the local community. From here, we took the opportunity to provide informal and formal environmental education such as no littering to the sea, no anchoring on coral reefs and etc. One example is we provided an opportunity for the primary school students (SK Pulau Sibu) in the island and mainland (SK Tenggaraoh) to make their own seagrass herbarium. Besides, a self-made model of dugong feeding trail was donated to the school and placed in their gallery to serves as a teaching material. We were likewise benefitted from this relationship as the islanders would provide us the first-hand information whenever they found a stranded dugong.

5. Are there any plans to continue this work?

Yes. I plan to continue researching on the dugong's feeding ecology in order to understand better on the habitat use of dugong and the drivers that motivate it. The feeding trail survey has considerable potential to be further developed into a long-term monitoring programme that would help us to recognise the impact of human perturbation onto the dugong habitat, and subsequently refine the management plan of Dugong Sanctuary from time to time.

Further plan is also including to share our works and findings to raise the awareness of the endangered dugongs and its important yet overlooked seagrass habitats, via a series of public awareness talk/ programme, online platform (social media), collaboration with local clubs/ parties/ schools, and with various NGOs. Training assistance on the seagrass species identification and feeding trail data collection protocols in the intertidal and subtidal seagrass meadows will be shared and delivered after this. Also, we plan to intensify collaboration with the dugong researchers from other countries (currently India, Thailand and Singapore), to exchange, learn and standardise our methods together to enhance the expansion of knowledge and conservation of dugong with its habitat.

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

We are currently drafting two manuscripts to be published in scientific peer-reviewed journals. The results will be shared later to the Technical Working Group which is working on the management plan of Dugong Sanctuary of Johor State, to assist with the delineation of the planned sanctuary's boundaries. We have also presented in various conferences and workshops as stated in the previous progress reports. Along the period, photos and updates from the field trip were posted in MareCet's [Facebook](#) page for public viewing.

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 from May 2017 and fully utilised by end of October 2018 (proposed May 2017 to May 2018). The issue encountered during the development of underwater monitoring system, in addition to coincide with the annual rainy monsoon season led to an unexpected delay for field testing and data collection in our original schedule.

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
Provision of first prototype unit (Electrical junction box, cable glands, CMOS camera board, power bank, R-Pi model and electronics)	2000	2000	0	The entire system was customised to suit the environmental conditions of the field site.
GoPro x 3	750	750	0	
Extended Battery Pack x 5	200	200	0	
Accessories for GoPro (e.g. casing, charger etc.)	50	50	0	
Boat transfer	0	180	-180	To transport the research team and all project gears from Tanjung Leman jetty, mainland Johor to the islands at the field site.
Boat rental	1200	1075	125	Rental included hire rates of the vessel, skipper fees and vessel fuel.
Portable External Hard Drive 1TB x 2	90	75	25	For storing of data and images.
Accommodation	300	300	0	For team members at the field site.

				Only cover one of the trips.
Dive equipment rental	200	158	42	Rental of dive tanks
Travel to/from study site	100	92	8	A one-way journey from Kuala Lumpur to Tanjung Lemau jetty is approximately 5 hours' drive and 360 km distance in total. Only cover one of the trips.
Field supplies (consumables), e.g. cable ties, tapes, batteries, charger, angle bar, paint etc)	110	120	-10	* Notes to Budget: 1 Malaysian Ringgit (RM) equals 0.18 British Pounds
Total	5000	5000		

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

1. The information that we have obtained through empirical study is critical to be published and conveyed to the federal and state governments (i.e. Department of Marine Parks Malaysia and Johor National Parks Corporation), especially management authority of the Dugong Sanctuary.
2. The population of dugongs is required to be assessed and updated due to the condition of the seagrass meadow in Sibutu Archipelago has been changed gradually following the northeast monsoon in 2016.
3. It is essential to form a composite team comprised of researchers and local citizens, to be able to exercise mid- to long-term monitoring of dugong habitats, and gather data to improve our understanding of the processes of how seagrass ecosystems recover from intensive disturbances like grazing by megaherbivore and/or annual monsoon.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did The Rufford Foundation receive any publicity during the course of your work?

Yes, the Rufford Foundation logo was used in all my oral presentation and posters (as listed in the progress report) and mentioned during the presentation in the funder section. Acknowledgment will be given to The Rufford Foundation in our manuscripts.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Dr Jillian Ooi and **Dr Louisa Ponnampalam** are my supervisors in this project who guided me in every aspect of the study, from the initial experimental design to the data analysis. Dr Louisa particularly suggested the idea of underwater monitoring system and advised about the development of the prototype.

Below is a complete list of team members:

Dr Jillian Ooi – Supervisor (Seagrass biogeographer)
Dr Louisa Ponnampalam – Supervisor (Marine mammal scientist)
Kee Alfian – Advisor (Marine scientist)
Affendi Yang Amri – Advisor (Marine scientist)
Ng Jol Ern – Field Assistant (Marine conservationist)

The prototyping of UMS-D was done with the help of Mr Aaron Lee Hsiu Eik, an engineer from Universiti Teknologi Petronas. Besides, we have had volunteers and interns recruited by MareCet and University of Malaya, to work on the field as well as in the laboratory. They came from different professions, i.e. undergraduate, graduate, pilot, reef ecologist, conservationist and dive instructor, to build on their scientific fieldwork skills and knowledge particularly on seagrass and dugong feeding study. They are Nina Ho, Mok Man Ying, Nazirul Amin, Dr Kotaro Ichikawa, Kotaro Tanaka, Tan Yee Keat, Gan Bin Qi, Kenric Chai, Khairul Afham, Karen Tsuzura, Kugai Yuma, Afifi Fadzil, Erin Abu, Loke Hai Xin, Ashley Chua, Wong Si Peng, Goh Kai Zhi, Lee Li Chuen, Lee Li Keat, Fatin Fadhila, Yong Sheau Ying and Gautham Raj.

12. Any other comments?

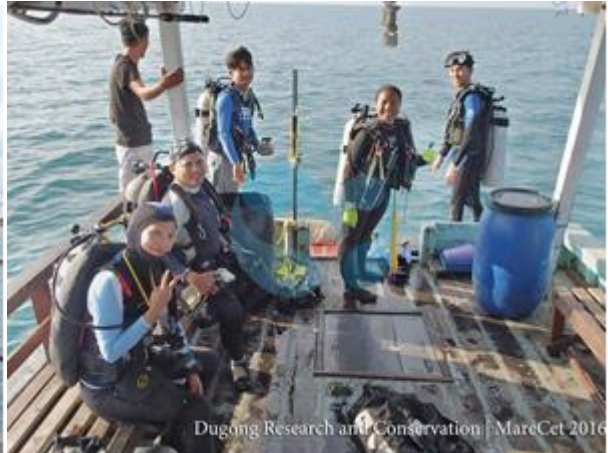
We would like to express big thanks to The Rufford Foundation for the grant in supporting our research, especially allowing us to develop the underwater monitoring system that helps to detect dugongs underwater. Your funds have also covered a big part of our field expenses to implement the system which is a big step forward on top from what we are limited to achieve at the beginning.

I am planning to further research on the feeding and behavioural ecology of dugongs in Malaysia in order to obtain more constructive information which to inform the policymakers. Besides, I am devoting myself to advocate on the conservation of dugong and its habitat in the next agenda, as I believe that “the direction in which education goes will determine a man's future life”.

Thanks again to The Rufford Foundation, and all personnel within that help us to achieve our goals, especially Jane Raymond who is being a thoughtful and efficient liaison between us. I sincerely hope in continue having support from The Rufford Foundation to strengthen our current research and monitoring regimes on the dugong and seagrass conservation in Malaysia and other locales.



Left: The elementary school students were learning on how to differentiate seagrass species and how to make herbarium. Right: A self-made sandbox simulating dugong feeding trail was donated to P. Sibul Primary School to be used as a teaching material.



Team Dugong-Seagrass Feeding Project Malaysia, comprised of researchers and conservationists from the University of Malaya (Malaysia) and The MareCet Research Organization (Malaysia), with the local villagers from Sibul and Tinggi Islands.