

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	Cyrus Rumisha
Project title	Enhancing fisheries management through monitoring of the patterns of gene flow between marine protected areas and nearby fishing areas in Tanzania
RSG reference	24625-1
Reporting period	1 June 2018 – 27 May 2019
Amount of grant	£4995
Your email address	rumisha@sua.ac.tz
Date of this report	27 May 2019

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 establish the extent of genetic diversity among the bivalves <i>Anadara antiquata</i> in marine protected areas (MPAs) and fishing areas along the Tanzanian coast				We collected a total of 180 tissue samples of <i>A. antiquata</i> from MPAs and fishing areas at the Tanzanian coast and amplified fragments of the cytochrome oxidase subunit I gene (COI). All sample sites showed high haplotype diversity and low nucleotide diversity.
To establish the patterns of gene flow between MPAs and fishing areas at the Tanzanian coast				We amplified COI sequences from 180 tissue samples of <i>A. antiquata</i> and used the sequences to assess the patterns of gene flow. The studied population showed extensive gene flow between MPAs and fishing areas implying that although some fishery areas show signs of overexploitation, if the MPAs are well protected, they are capable to replenish depleted areas.
To assess the perception of local communities towards MPAs				We used social surveys to assess the perception of fishing communities towards MPAs. We observed that the majority of the fishermen are aware of the MPAs objectives and they had a more positive opinion regarding the MPAs. However, the fishermen demand active involvement in decision making and management of the MPAs

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

Delayed delivery of the laboratory consumables was the main challenge to the project. The supplier delivered the lab consumables about 2 months after receiving the payment. The problem was addressed through rescheduling of some of the project activities. Another problem was the failure to obtain adequate samples of the bivalves from some fishing areas. So we had to collect samples from more sites and pool samples from nearby sites in order to obtain adequate samples for a meaningful genetic analysis.

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

- Improved understanding of the patterns of gene flow between MPAs and fishing areas. We observed extensive gene flow between MPAs and fishing areas in Tanzania. This implies that although signs of overexploitation were observed in some fishing areas, the MPAs can replenish the overexploited areas and protect species against local extinctions. Also, through genetic analysis we identified the priority areas for establishment of MPAs. This information will be shared with the managers and published in an open access journal by the end of the year.
- Increased awareness of the extent of genetic diversity and the demographic history of the bivalve *A. antiquata* at the Tanzanian coast. We observed high haplotype diversity and low nucleotide diversity at all sample sites along the Tanzanian coast. Also, it was observed that the studied species experienced periods of population growth in its recent history. The effects of historical environmental changes on the stock structure of the bivalves were documented and they will be published to enable managers and other stakeholders to understand future scenarios for the development of sustainable fisheries.
- Increased awareness of the perception of fishing communities towards MPAs. We observed that the majority of the local fishermen are aware of the MPA objectives and had a more positive opinion regarding the MPAs. However, the fishermen were not satisfied with the level of involvement in decision making. Also signs of non-compliance were detected at some sites. Therefore, active engagement of the local communities in decision making and extensive outreach are recommended for sustainable management of the MPAs. All this information was communicated to managers and it will be disseminated to other stakeholders by the end of the year.

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

Fieldwork was conducted in collaboration with the local communities along the Tanzanian coast. We worked closely with the local fishermen during the collection of tissue samples. The fishermen did not only benefit from the project by receiving some monetary support for the hours they worked with us but also they gained a lot of knowledge regarding the importance of MPAs on the sustainability of the fishery resources. Generally, very long discussions were conducted during sampling in order to investigate the opinion of fishers towards MPA and to raise the awareness of the fishers regarding the importance of the MPAs. Furthermore, the local communities participated in interviews and questionnaires which were conducted in three fishing villages to investigate the perception of the fishers towards MPAs and to assess their support for the MPAs. A total of 30 fishermen, village leaders and fisheries officers from each village were interviewed. The interviews were followed by focal group discussions which were aimed at raising the awareness of the local communities regarding MPAs and the importance of conserving the fishery resources.



Figure 1: Rumisha and the local fishermen collecting tissue samples of the bivalve *Anadara antiquata* in seagrass beds in Lindi, Tanzania



Figure 2: The bivalve *Anadara antiquata* (Rumisha 2018)

5. Are there any plans to continue this work?

Yes. This project established the patterns of gene flow between MPAs and fishing areas. We plan to extend this work by using decision support tools such as Marxan with zones to identify areas that meet biodiversity targets and are socially and economically cost-effective for conservation. Since the country is planning to increase MPAs from 6.5 to 10% by 2020, identification of areas that meet biodiversity targets and are of low climate impacts and conflicts with fishers and other stakeholders is crucial. This information is required to enable decision and policymakers to make informed decision.

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

The findings of this project have already been shared with managers and fisheries officers from coastal areas in Tanzania. We plan to submit the findings of the project for presentation at the Annual Scientific Conference for the Tanzania Society of Animal Production (TSAP). All mitochondrial DNA sequences will be published in the Barcoding of Life Data Base and GenBank repositories. Furthermore, the findings of the project will be published in a peer-reviewed journal by the end of this year.

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 for the period between June 2018 and May 2019. It was used for field trips along the Tanzanian coast to collect field samples and to administer questionnaires and interviews. The actual length of the project is 19 months. Currently, more than 95% of the laboratory work is already done. Laboratory work and data analysis will be completed in the next 2 – 3 months. An additional 3 – 4 months are anticipated for preparation of manuscripts and publication of the research findings in conference proceedings and peer-reviewed journals.

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
Application for permits	90	20	-70	We only paid for bus fare to the capital city. We were not charged for the permits. The difference was used for other project activities
Per diems and local transport during reconnaissance	270	270		Used as planned

survey				
Per diems and local transport during field work	1045	1045		Used as planned
Purchasing of sampling bottles and preservatives	200	100	-100	The difference was used for other project activities
Purchasing of DNA extraction kits	450	493	+43	
Purchasing of laboratory consumables	950	900	-50	The difference was used for other project activities
Purchasing of PCR reagents	630	500	-130	The difference was used for other project activities
Costs for DNA sequencing	880	1100	+220	We planned to sequence 4 plates but we sequenced 5 plates
Shipment costs	140	278	+138	£138 Extra was used to pay for delivery of laboratory consumables
Stationery	120	100	-20	
Data analysis and preparation of manuscripts	120	120		Used as planned
Miscellaneous	100	100		Used as planned
Total	4995	5026	+31	

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

Since initiatives are taken to increase MPAs in the country, the observed patterns of genetic diversity and gene flow should be integrated in the delimitation of the MPAs. This can be achieved by using decision support tools such as Marxan with zones to integrate the genetic, social, and other data in order to identify priority areas for expansion of the existing MPAs and areas for establishing new MPAs. Also, since signs of non-compliance were detected, outreach campaigns should be conducted to improve awareness and reduce illegal fishing.

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 logo was printed on the questionnaires which were distributed to the local people during social surveys. Also, the foundation will be acknowledged in the conference proceedings and the peer-reviewed paper which will be published online by the end of the year.

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

Dr. Alex Nehemia	He is a co-investigator. He participated in fieldwork, laboratory work and all other project activities
Local fishermen	A total of 30 fishermen (five from each site) helped us during the collection of tissue samples
Fisheries officers	We worked with about six fisheries officers from the Tanzanian coast. They helped us during social surveys and the collection of tissue samples

12. Any other comments?

I am very thankful to the Rufford Foundation for funding this project. The project gave me an opportunity to contribute knowledge for sustainable management of the fishery resources and to interact with different stakeholders. Through the project, I have established links and networks with policymakers, fisheries officers, and other stakeholders. Such links are crucial for my career development. Furthermore, I will publish one conference proceeding and one journal paper, which are very important for my career.