

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	Clare Duncan
Project title	Planning for change: managing mangroves in the face of climate change
RSG reference	15169-1
Reporting period	2014-2015
Amount of grant	£5,948
Your email address	clare.duncan@ioz.ac.uk
Date of this report	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
Collect information on the ES provision of restored and natural mangrove forests, namely carbon content (vegetation and soils) and coastal protection potential.				This data has been fully collated and has been partially published in a peer-reviewed journal (here), with another publication in prep. The data has also been presented at Local Government Unit (LGU), Department of Environment and Natural Resources (DENR) and partner coastal community feedback/discussion sessions, and included within policy/rehabilitation guidelines leaflets for distribution in-country.
Collect information on the abundance, diversity and distribution of under-studied ecosystem engineering <i>Uca</i> fiddler crab species.				
Train five local Research Assistants in methods of biodiversity monitoring (crabs), and carbon stocks and coastal protection potential/storm damage.				Three Research Assistants trained in field mangrove biomass and carbon stock inventory (vegetation and sediments) methodologies [also mangrove species identification training], and methods for fiddler crab surveying; 11 further local community members partially trained in biomass surveying and sediment sampling techniques; three LGU staff partially trained in biomass surveying and sediment sampling techniques
Produce a training manual				The resource is part completed in

<p>for mangrove carbon monitoring and assessment for use by future students, researchers and practitioners in the region, including information on Philippines-specific best-practice advice regarding equipment, methodologies and administrative procedures.</p>			<p>English. Using data collected during this project, a potential future carbon Payments for Ecosystem Services project is being developed in Panay Island. The training manual materials will thus now also contain reference material on carbon payment mechanisms and project planning. The final resource will thus be extended and will be completed in the coming months. The resource must then be translated to Tagalog and printed and distributed in-country.</p>
<p>Produce a local guide to mangrove invertebrates and their roles in mangrove ecosystems. During crab surveys and soil carbon sampling, photographs will be taken of important ecosystem engineering species (grapsid and fiddler crabs, soil-living detritivores and molluscs), and an educational guide will be researched and produced (English and Tagalog) for use by local communities and schools to encourage understanding of the importance of mangrove invertebrate diversity.</p>			<p>The resource (educational infographic resources) is part-completed in English, and will be finalised in 2017. The resource must then be translated to Tagalog and printed and distributed in-country.</p>
<p>Produce guideline documents for future community-based mangrove replanting efforts to improve ES provision, with information on the</p>			<p>Policy briefing and guideline documents for LGU staff, DENR staff and partner local community members has been produced regarding the climate change mitigation and adaptation potential (carbon stocks and</p>

<p>importance of structural composition, mangrove species diversity, and site configuration of sites in determining restored mangrove health.</p>			<p>coastal protection) benefits from targeted reversion of abandoned aquaculture ponds to former mangrove forest over low-intertidal seafront rehabilitation, and the importance of rehabilitating for dense structural composition and higher species diversity. These resources are used in ZSL-Philippines Training of Trainers (for mangrove protection and rehabilitation) courses for LGU staff, DENR staff and partner local community members. In February 2016, a tour of LGU offices (seven municipalities) was conducted to provide feedback and discussion sessions with LGU staff, DENR staff, Bureau of Fisheries and Aquatic Resources (BFAR) staff, and partner local community members. These presentations and discussions focused on advocacy for reversion of abandoned fishponds, enrichment and novel planting for increasing mangrove species diversity, and the importance of high mangrove functional diversity and structural complexity for enhancing coastal protection potential. The sessions facilitated discussion between disparate but influential government departments responsible for mangrove management, and local community members.</p>
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

There were no major unforeseen difficulties that arose during this project. The outcomes of the project as originally stated have all been either partially or entirely completed to date, and all remaining objectives are on track to completion (some being extended). The only unforeseen difficulty that arose was due to adverse weather conditions (typhoon) during latter parts of the field project, meaning that total field time (and budget) had to be extended in order to complete data collection. However, borrowing of equipment from external researchers and lower than expected air travel costs (see Budget) meant that the additional budget requirements could still mostly be covered within this grant.

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

a) Quantification of rehabilitated and natural mangrove carbon stocks and coastal protection across Panay Island, Philippines.

This study provided one of the first quantifications of carbon stocks and coastal protection potential in multiple rehabilitated mangrove forest areas across Panay Island (which has seen substantial historical mangrove deforestation). This included quantification of carbon stocks in rehabilitated abandoned aquaculture ponds and in low-intertidal seafront areas (current focus of the Philippines' National Greening Programme for greenbelt rehabilitation following super-typhoon Yolanda). Major findings from this area of the project have enabled quantification of the larger relative climate change mitigation and adaptation potential of abandoned aquaculture pond reversion (a legal requirement under current Philippines law) over current nationally-implemented low-intertidal seafront rehabilitation activities. The project has developed methodologies for prediction of potential climate change mitigation and adaptation gains (carbon stocks and coastal protection potential) under scenarios of targeted aquaculture pond reversion to former mangrove. Further development of these methodologies may facilitate discussion and implementation of spatial planning for mangrove greenbelt rehabilitation in priority areas across the island.

The data also enabled quantification of carbon sequestration as a result of previous mangrove rehabilitation activities, providing baselines for the study of carbon stock development in rehabilitated mangrove areas; key data for development of any afforestation-based blue carbon Payments for Ecosystem Services (PES) schemes in the Philippines and more widely. The carbon stock data collated during this project covers extensive rehabilitated and natural mangrove areas across the island. These data also provide baseline data to support future protection of currently protected

and unprotected ancient mangrove areas, and for inclusion in potential future blue carbon project development in Panay island coastal areas.

b) Production of resources for mangrove rehabilitation practices in the Philippines.

The project findings regarding mangrove rehabilitation in abandoned aquaculture ponds versus low-intertidal seafront areas targeted by the NGP have resulted in the production of policy briefing and guideline documents (one of these documents is attached herein) for relevant government departments responsible for administrative and physical reversion of abandoned aquaculture ponds. These best practice guideline documents also contain information on study findings regarding the importance of multi-species planting in rehabilitation activities; analyses from this project found that increased functional/structural diversity of mangrove species may enhance per unit area coastal protection potential. These documents are now distributed as training materials within ZSL-Philippines Training of Trainers courses to government departments, NGO staff and partner local community members. In addition, these documents are used to support further advocacy work by ZSL-Philippines to enforce legal requirements and alter current mangrove management and rehabilitation practice in the Philippines.

The in-production Philippines-specific training manual for mangrove carbon stock assessment and monitoring will be distributed to LGUs, government departments, NGO staff and partner community members and peoples organisations into the future through ZSL-Philippines-run training courses on mangrove identification, rehabilitation and monitoring. These materials will build in-country capacity for mangrove biomass monitoring and for any future blue carbon-focused PES projects. The resource identifies appropriate in-country procedures for field monitoring and laboratory analysis of materials and samples.

The in-production local infographic guides to mangrove invertebrates and their roles in mangrove ecosystems will similarly be distributed through ZSL-Philippines channels through partner local communities and people's organisations, and at mangrove training courses. It is hoped that this resource will increase general awareness of the importance of faunal communities in the healthy functioning of the mangrove ecosystems upon which many depend, in addition to the role that mangroves play in enhancing coastal faunal communities and fisheries.

c) Facilitation of discussion between government departments and partner local communities on mangrove management and rehabilitation for climate change mitigation and adaptation.

Project feedback/discussion sessions were held with municipal LGU staff, regional Department of Environment and Natural Resources and Bureau of Fisheries and Aquatic Resources officers, and partner local community and people's organisation members across seven coastal municipalities in Panay Island. These sessions reported back on findings regarding both the climate change mitigation and adaptation advantages of mangrove rehabilitation in abandoned aquaculture ponds, and the importance of multi-species mangrove rehabilitation for stronger coastal protection potential (current government rehabilitation practices centre mostly on single species [*Rhizophora* spp.] planting). These sessions proved extremely beneficial for re-addressing the complex and growing problem of abandoned aquaculture area in Panay and the wider Philippines, as well as the strong political will of some municipal LGUs to support abandoned aquaculture reversion to mangrove forest. The slow integration of greenbelt rehabilitation focus on abandoned aquaculture pond reversion and mangrove rehabilitation in the Philippines has historically largely been due to low political will and communication between multiple responsible government departments (DENR and BFAR). The feedback/discussion sessions facilitated early-stage dialogue between these and other key groups surrounding abandoned aquaculture ponds, their reversion and potential benefits to key local community stakeholders.

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

Project sites were areas in which the Zoological Society of London (ZSL)-Philippines has worked in partnership with local communities and people's organisations for several years, in mangrove and other coastal conservation projects, typhoon disaster risk reduction and livelihoods building activities. The activities conducted within this project have served to provide quantitative data and evidence to support the mangrove protection, enrichment and rehabilitation activities conducted with and by local community members in multiple sites. The research has provided guidance on multi-species mangrove planting for enrichment purposes, training in mangrove community structure and biomass (carbon stock) monitoring, and educational and training resources on mangrove ecology and biomass and carbon stock monitoring for partner people's organisations. The resources produced will continue to be disseminated to community members through ZSL-Philippines Training of Trainers courses to build capacity for mangrove management and monitoring within coastal communities. Feedback/discussion meetings to disseminate research findings have also strengthened knowledge regarding the

importance of appropriate mangrove rehabilitation (e.g. targeted abandoned fishpond reversion) for coastal protection in typhoon-prone areas, and enabled much-needed discussion between community members' and the relevant government departments responsible for mangrove planting activities and abandoned pond reversion.

5. Are there any plans to continue this work?

Yes – future plans include to use baseline carbon stock data collected here to explore the potential for payments for ecosystem services projects across the island. Future plans also include research into measures for spatial prioritisation of areas for mangrove rehabilitation across Panay Island and the wider Philippines, and to expand research and conservation activities focussed on mangrove rehabilitation for coastal protection.

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

The findings from this project have already been disseminated widely to partner local community members, relevant government departments and in-country academic institutions. The work has also been presented at international academic conferences and symposia, and published in a peer-reviewed research paper. Going forward, the results will continue to be disseminated internationally at conferences, through the IUCN/SSC Mangrove Specialist Group channels, and in further planned research papers currently in prep.

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 project was begun in September 2014 and timetabled to end in September 2016. Many of the objectives have been achieved to date; expansion of project goals has led to further development of remaining in-progress outputs.

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: London - Iloilo	1100	836.70	263.30	Cheaper flights were sourced than originally budgeted
Travel: Car (driver + fuel)	100	72.37	27.63	More reliance on public transport due to high cost of car rental
Travel: Other (visas, taxes, taxis)	150	306.43	-156.43	Extension of field season meant an increase in travel costs
In-country research costs: Research Assistants (£5/day x 60 days x 5 people)	1500	1777.35	-277.35	Extension of field season meant an increase in number of days RAs were employed
In-country costs: Food (£5/day x 60 days)	300	404.52	-104.52	Extension of field season meant an increase in food costs
In-country costs: Accommodation (£10/day x 60 days)	600	821.96	-221.96	Extension of field season meant an increase in accommodation costs
Equipment: Maxiclin clinometer	28	28	0	
Equipment: Callipers (Verneir AK962 150mm/6")	25	25	0	
Equipment: Tape measures (Advent AFG1-3013 30m)	36	36	0	
Equipment: Soil sample bags (£41.95/100 x2)	84	33.42	50.58	Less sample bags were required than originally calculated
Equipment: Plastic sample bags (£6.49/per 10 x5)	32	32	0	

Equipment: Kit bag	20	20	0	
Equipment: Quadrats (£22 x 5)	110	46	64	Quadrats were built from different materials, reducing costs
Equipment: Binoculars (Nikon 10x50 Action EX)	149	149	0	
Equipment: GPS Unit (Garmin eTrex 20 Receiver)	153	0	153	We were able to loan a GPS unit from other fieldworkers.
Equipment: Stationary	40	43.88	-3.88	
Equipment: Replanting guidelines printing (A4 x 5 pages (90gsm paper £0.45; 150 Micron lamination £0.79) x100 copies)	620	620	0	* These costs are yet to be paid, but these figures remain accurate to date.
Equipment: Mangrove biodiversity guide printing (A5 x 30 pages (150gsm paper + 300 gsm for covers with wire binding; £3 each) x 300 copies)	900	900	0	* These costs are yet to be paid, but these figures remain accurate to date.
Total	5948		-205.63	

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

For now, the next steps are to complete production and extension of the training, guidelines and educational resources that are in progress, and to publish remaining results from the project. Going forward, the findings from this project will continue to be disseminated to local community members and relevant government partners through ZSL-Philippines, and incorporated in to future blue carbon mangrove conservation project development (PES).

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 Foundation logo was displayed in numerous presentations of the data and research conducted in this study, including but not limited to: Local Government Unit feedback/discussion sessions; the 27th International Congress for Conservation Biology 4th European Congress for Conservation Biology, Montpellier,

France; the British Ecological Society 2015 Annual Meeting, Edinburgh, UK; IUCN/SSC Mangrove Specialist Group Symposium 'Turning the tide on mangrove loss: a focus on the state of mangroves in Asia', Xiamen University, Xiamen, China; 4th Mangrove & Macrobenthos Meeting, Flagler College, St. Augustine, Florida. The Rufford Foundation Small Grant was also acknowledged within publication containing data and analyses conducted through the use of this grant: <http://www.sciencedirect.com/science/article/pii/S0025326X16303502>. The Rufford Foundation logo has been featured on all policy and training documents produced within this project to date, and will be featured on all on-going project resource documents (Philippines-specific carbon monitoring guidelines; educational mangrove ecology infographics).

