

## 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](mailto:jane@rufford.org).

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
<b>Your name</b>	Andrea Marshall
<b>Project title</b>	Monitoring and Protecting the World's Largest Gathering of Giant Mantas
<b>RSG reference</b>	13062-1
<b>Reporting period</b>	26 <sup>th</sup> April 2013 – 26 <sup>th</sup> April 2014
<b>Amount of grant</b>	£6000
<b>Your email address</b>	andrea@marinemegafauna.org
<b>Date of this report</b>	2/04/2014

**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 examine the seasonal habitat use by giant mantas around Isla de la Plata.		X		To gain a full understanding of seasonal habitat use, studies must be conducted through varying seasons and across multiple years. This year's study was very successful and has given us the first window into their habitat use regionally during the 2013 season. Preliminary results have indicated what predominant features underlie the giant mantas aggregative behaviour at particular sites along the Ecuadorian coastline.
To obtain data on the frequency and duration of visits to more than one aggregation site along the Ecuadorian coastline.			X	<p>The grant allowed us to tag 10 individual giant mantas with acoustic tags giving us an unprecedented view into how they use at least two sites within our study area. Amazingly the frequency with which some of the individuals used one of the sites (Cope) differed dramatically from the others sites at Isla de la Plata. In fact, the regularity with which some individuals use the habitat at Cope suggests that these individuals were staying at this location on a semi-permanent basis within the season, a stark contrast to the high rates of turn over in the mantas visiting Isla de la Plata.</p> <p>Also interestingly, we did not pick up any cross-habitat use by individuals tagged in either of the two locations. This result was also surprising given that these areas are both heavily trafficked by mantas during the season and are not far apart (62 km). Photographic records indicate that this population is comprised of over 1300 individuals. It is likely that these preliminary results were influenced by the low numbers in tagged individuals so increasing our effort would be useful next year.</p> <p>Tag retention is typically good in manta rays and tags can stay on animals for up to 2 years. It is likely that when the listening stations are downloaded at the</p>

				beginning of the next field season, we may pick up more data on interchange between these two important habitats.
This technology will help to supplement photographic information on inter-annual visitation of this area.			X	Individual manta rays that had not been captured using photo identification were recorded by acoustic receivers as being present at Isla de la Plata and Cope. Divers are constrained by so many factors: the amount of time they can spend underwater, the area they can cover on visual transects, the time of day they can dive, etc. Acoustic telemetry was incredibly useful in documenting visitation to these sites that divers would not have been able to be documented by visual surveys or photo ID methodology. Initial results gave us a much clearer picture of habitat use at these aggregation sites. Ultimately, accurate records of presence and absence of individuals that are not affected by diving effort bias will enable more robust population estimates and information on the drivers of movement for <i>M. birostris</i> .
Examining interchange between this important aggregation area and those in other parts of the region.		X		Picking up on interchange between regions is a longer term result that can only come from strong collaborations with scientists from other areas. We were fortunate enough to form relationships with scientists using the same technology as us in the Galapagos National Park offshore, where our giant mantas are known to migrate on occasion. The transmitters in the Galapagos are deployed across a good portion of the archipelago increasing our chances of tag detection but receivers are retrieved and downloaded infrequently and sporadically in the Galapagos so to date we have not received any information on our tags from the islands. A list of the serial numbers of acoustic transmitters has been given to researchers in the Galapagos and we are busy trying to obtain a list of their tags for our records. We did pick up a tag of unknown origin one our array along the mainland and we are busy trying to determine the origin of this tag.

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

The visitation of giant mantas along the Ecuadorian coastline appears to be strongly seasonal, with most manta rays passing through or using coastal habitats between July and October each year. In 2013, the manta season commenced earlier than normal with the majority of observed visitation occurring in June and July, before our research team arrived. Initially, we had planned to tag individuals that spanned a range of sizes and colourations, but as a result of the lower number of individuals, we deployed the tags a bit more randomly with most tags attached to mature individuals and more tags placed on male mantas than females (ideally this would've been a 50:50 ratio). The unexpected seasonal shift may also mean that we did not acquire as much data as we would have in a normal year. Still, our team managed to deploy all of the intended stations and tags and we hope that the data we did obtain might prove interesting when compared to a more normal year in the future.

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

1. Individual giant manta rays leave and return to aggregation sites in Ecuador during a single field season.

Most photo identification records to date show that individual manta rays are spotted once during a season and then not until the next year, or not again ever. With the continuous data collection that acoustic telemetry provides, this project was able to establish that individuals do leave and then come back to aggregation sites during the season, sometimes on a regular basis. This is a result that has never been picked up by visual transects or photo ID work in past years.

2. Photographic identification is limited in its ability to successfully pick up on manta presence at aggregation areas.

Data for two individual manta rays showed that they were present at aggregation sites during the time that research divers were conducting visual transects but they failed to pick up on their presence. While this is to be expected, considering the limitations of recreational SCUBA, it again establishes that multiple methodologies are needed to accurately represent patterns of activity at these sites during the season.

3. Manta rays use these two identified aggregation sites in Ecuador during the day and night. Observational records of giant manta rays in Ecuador are subject to a temporal bias due to the location of the aggregation sites which are both around 40 km offshore. Night dives are not possible and therefore no information previously existed on the presence of manta rays at night. The acoustic telemetry results demonstrated that individual manta rays were present at Isla de la Plata throughout a 24-hour period, a startling result for any aggregation site globally, with most mantas rays thought to vacate inshore areas and use deeper offshore areas in the night-time hours.

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

Throughout the season, several research talks were given to interest groups throughout Ecuador. Audiences ranged from rangers at the Machalia National Park, to community members and stakeholders in Puerto Lopez, the major fishing town in the area, to governmental officials and heads

of NGOs working in the capital of Quito. Disseminating our findings each year and updating interest groups as we learn more about this important population of rays enables them to continuously adapt strategies for the management of this species, alter their behaviour towards these animals to reduce human related conflicts, and embrace the research on this species in real time.

#### **5. Are there any plans to continue this work?**

Proyecto Mantas Ecuador's programme grows and strengthens each year. Field seasons are being extended with increased financial support and more technologies are at our disposal to learn more about this poorly understood species. It is commonly recognised that this is the most important aggregation area for giant manta rays in the world, with the largest identified population of giant mantas having been identified in these waters, giving unprecedented access to individuals for research purposes. It is imperative that we continue this work and build on the information that we have collected to date. Giant manta rays are a long-lived species and in order to enhance our ecological understanding of this animal long-term observations and data are needed. This first year of acoustic telemetry work represents the start of what is hoped to be an extensive acoustic program on this species supported by a large array of acoustic receivers along the coast of Ecuador.

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

- Open access peer reviewed journal articles.
- Ultimately the results of this study will form part of a PhD thesis by Katherine Burgess, a student at the University of Queensland.
- Results will be shared in the Marine Megafauna Foundation's yearly research report to the Ecuadorian Ministry of the Environment.
- Presentations at our partner Universities; the University of Queensland (Australia) and San Francisco University (Ecuador).
- Public talks in Australia and Ecuador.
- Blog articles featuring on the Marine Megafauna website and the website for the Centre of Marine sciences (University of Queensland).
- Results will be featured in a PBS/National Geographic documentary set to film in 2014 and a documentary proposed with BBC in 2015 (a segment for the new Oceans Series for the Natural History Unit)

#### **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 Rufford Foundation grant was used over the entirety of the 2013 field season in Ecuador (July-October) however the acoustic stations are still down and tags are active, so technically the current study is on-going until the batteries on the tags fail or until the tags come off the animals.

The projected length of the project is anticipated to be 5 years. It would be critical that the study at least lasts for the duration of Katherine Burgess's PhD project (3 years), as it is an important component of her current study.

**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
3x Vemco VR2 hydrophones	£3000	£2,922.62	+£77.37	Hydrophones were ordered without batteries which made them cheaper than the original quote we had from the manufacturer. (1 USD=0.658 GBP)
9x Vemco V16 acoustic tags	£2500	£2,302	+£197.35	Nine tags ordered from the manufacturer instead of 10 stated in the budgeted amount. Only nine tags were available matching our specifications at the time of ordering. (1 USD=0.658 GBP)
3x Hobo Water Temperature Pro V2 Loggers	£240	£270.84	-£30.84	Hobo temperature loggers were ordered in Australia where the price for each logger is +£10 more compared to the American distributor. (1 AUD=0.636 GBP-May/June, 2013, UK Exchange rates, Ltd)
Miscellaneous materials for attachment tags and temperature loggers	£60	£148.12	-£88.12	An activation probe needed to be ordered for the Hobo temperature loggers to be able to offload the data (£87.04) (1 AUD =0.636 GBP) An activation key was needed to activate the Vemco Hydrophones (£23.03) (1 USD =0.658 GBP) Lithium batteries for Vemco Hydrophones (£38.06) (1 USD =0.658 GBP)
Shipping costs and other miscellaneous costs	£200	£174.91	+£25.09	Hobo temperature freight costs were (£9.54). additional taxes were also added onto the Hobo order (£36.74) (1 AUD =0.636 GBP) Freight for Vemco Equipment (£69.09) was less than projected as we were able to get it delivered from Canada to an address in the United states where it was brought to us in Ecuador, instead of direct shipping to Ecuador. (1 USD =0.658 GBP) Bank costs for wire transfer to Vemco (£69.08) (1 USD =0.658 GBP)
<b>Total</b>	<b>£6000</b> <b>*£5997</b>	<b>£5819.50</b>	<b>+£177.50</b>	*Original transfer to Marine Megafauna Foundation account = <b>\$9,114.20</b> . 1 USD =0.658 GBP for May/June 2013(Exchange rates UK,Ltd)

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

Now that we have demonstrated that the proposed methods work and offer us unique data, it would be imperative to expand this programme considerably. It is difficult to deduce much from such a limited data set, only 10 individuals. Given the opportunity in the next field season, we would like to:

- Tag more animals. Tagging at least another 20 individuals in the 2014 season would be important to gain a better understanding of residence and site fidelity patterns of *Manta birostris* at Isla de la Plata and other aggregation sites in the region.
- Increase the area covered by the acoustic array along the Ecuadorian coastline with another five stations. Currently, the stations at Isla de la Plata are placed so that they will only detect animals coming to the north/north west of the Island. More stations placed on the south of the island will allow us to gain a deeper understanding into habitat use patterns around Isla de la Plata. In addition, during the 2013 field season two more important aggregation sites were discovered in the region. More stations would allow coverage of these newly identified sites and enable us to examine broader scale movement patterns of giant manta rays between areas of high to low protection from fishing activities.
- Build an online network by which researchers using acoustic telemetry in Ecuador can trade information relating to acoustic telemetry studies, i.e. service records of stations, foreign tags being picked up by various micro-arrays.

## 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?

- During all public talks given in Ecuador this season (of which there were nine) Rufford was featured as a sponsor of the programme (see example photo attached). Some of these talks had audiences of over 100 people in attendance.
- Blog for the Marine Megafauna Foundation website (newsletter circulation= 1500 people) and Facebook page (9,764 likes).

### *Future events*

- May 2014: Confirmation of PhD candidature presentation (Katherine Burgess, University of Queensland).
- June 2014: Sharks International Conference, Durban (Katherine Burgess poster presentation).
- Results will be featured in a PBS/National Geographic documentary set to film in 2014 and a documentary proposed with BBC in 2015 (a segment for the new Oceans Series for the Natural History Unit).

## 11. Any other comments?

Funding from Rufford was instrumental in expanding our current knowledge of the habitat use of giant mantas off the Ecuadorian coastline. This was an area of study that we very much wanted to tackle but lacked the funding to do so. This study comprises a large part of a study being conducted by one of my PhD students, Katherine Burgess. Due to the high costs of specialised equipment she may not have otherwise been able to design a study that focuses on the feeding ecology and habitat use of this species in Ecuador.

The results of this particular study have prompted the Ministry of Environment in Ecuador to discuss designating the newly discovered manta ray aggregation site at Cope as a protected area. Preliminary acoustic tagging data confirmed that giant mantas use Bajo Cope just as much as Isla de la Plata, which is already under national park protection. Without acoustic tags and receiver stations, the importance of this new aggregation site for this highly vulnerable species may have been unknown for many years to come. Cope is subject to high fishing pressure and our team witnessed many mantas entangled in fishing nets and sporting fishing hooks. Both the Machallia National Park and the Ministry of the Environment feel that an expansion of the seasonal protection for manta rays may be necessary to ensure more comprehensive coverage of their critical habitats in the region.

We thank Rufford for their generous support of this project and hope that we can continue to collaborate with this Foundation in the future as we expand our work on giant manta rays.