

## 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	Dr. Owen R. O'Shea				
Project title	Genetic connectivity and gene flow in dasyatid rays among fragmented habitats in The Bahamas				
RSG reference	18982-1				
Reporting period	November 24 <sup>th</sup> 2015 – November 24 <sup>th</sup> 2016				
Amount of grant	£5,000				
Your email address	owenoshea@ceibahamas.org				
Date of this report	7th November 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	Partially	Fully	Comments
	achieved	achieved	achieved	
To survey and collect 40 individual Himantura schmardae for white muscle tissue harvest			X	We exceeded our estimate and collected 70
To sample among four distinct locations			X	We visited the four locations and collected DNA from three – we only saw two individuals at the fourth location but it was too treacherous to catch them so we ended up with three distinct locations instead of four whereby we collected animals.
To sequence DNA from individuals across multiple spatial scales to assess connectivity and gene flow			X	All of our samples (n=70) are currently in the lab and sequencing is currently taking place.
Manuscript preparation		X		We are planning to produce two manuscripts from this project and this will be fully achieved as soon as sequencing and analysis is complete. A third (not previously considered) manuscript was just accepted detailing new range extension in this species for The Bahamas.



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

No difficulties were experienced.

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

The analytical component of this work is currently underway and so the greatest and most important outcome of this project will be the results generated from the nextgeneration sequencing. This will provide essential information pertaining to the migratory and radiation potential of this stingray and will provide critical data regarding conservation strategies and management implications for this species, as well as habitats that support it.

Furthermore, this project has verified - for the very first time – this species' presence in the Bahamian archipelago. *Himantura schmardae* is known only from anecdotal records and is not formerly recognised as populating The Bahamas. We have just had a manuscript accepted for publication that describes this updated locality record range extension and this work was in part funded through this grant.

I have presented this work on three different platforms including international conferences, but more recently I had an audience with The Bahamas National Trust (BNT) and they have cited my recent paper and continued effort in highlighting this particular species existence in The Bahamas as a cause for increased conservation efforts. This includes the development of new marine protected areas throughout this country, targeting specific areas of high ecological value based on the work that this grant has funded.

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

- The Bahamas National Trust has requested use of data and used it directly for inclusion in MPA planning after seeing a presentation I arranged for them.
- We have run nine outreach initiatives on Eleuthera and Great Exuma Island for local schools to participate in our field sampling and data collection. This included full days of presentations before heading out on boats to physically catch stingrays and collect all of the genetic information required. This has provided hands on, science experience for a range of Bahamian youth and future leaders.
- This project has also seen around 30 educational programmes participate in our field sampling from USA based school and university groups, so while not 'local' we have been promoting the importance of Bahamian ecosystems



and marine conservation science through this project to a wide range of students and educational facilities.

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

Absolutely. There are plans to design and conduct the next logical step in this assessment of coastal rays. More specifically I have already arranged a graduate student from Ruhr University in Bochum, Germany who aims to assess population genetics of a sympatric species of ray and this work will include collaborations with two further organisations, building on the foundation this current work has provided.

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

- We have just had one paper accepted O'Shea, O.R., Ward, C. and Brooks,
  E. J. (In Press). Range Extension in the Caribbean whiptail stingray (*Himantura schmardae*) from The Bahamas. Caribbean Naturalist.
- Data generated from our sequencing will result in one further paper describing the next generation results, which has a submission target of 1<sup>st</sup> quarter 2017.
- We are also currently planning a technical paper describing this analytical and genetic approach for conservation applications current target for 2<sup>nd</sup> quarter 2017 submission.
- This work was communicated at two international conferences as well as several local workshops/seminars for school groups and NGOs and will be used to promote these methodologies further for applied conservation initiatives.

# 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 the last ten months, all physical samples were collected and are now lodged with Dr Liz Wallace at the Florida Fish and Wildlife Conservation Commission (FFWCC) awaiting imminent analysis.
- Preparation of manuscripts will be beyond the reporting period, but this is quite normal for such an ambitious project with the exception of the range extension paper.



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.

### Final Budget - 26<sup>th</sup> October 2016: 1USD = 0.82 GBP Original Budget – 19<sup>th</sup> August 2015: 1USD = 0.64 GBP

Item	Budg Amou	Actu Amo	Differ	Comments
	eted unt	unt unt	ence	
Boating – Panga use for field sampling and site access	3187	1328.72	1858.28	We were more efficient in our animal location and capture that resulted in a significantly reduced field effort
Steel headed dart tags	58	103.03	45.03	We tagged more rays than anticipated
PIT tags	153	274.74	121.74	As above
Field sampling - flights	329	421.92	92.92	We increased our field effort by one technician to maximise success
Field sampling – transfers and excess baggage	127	356.25	229.25	This includes excess baggage fees that were unaccounted for initially. We travelled with field sampling equipment that took up much space on flights.
Analytical processing – next generation sequencing	1115	1318.83	203.83	This difference is likely a result of a relatively significant change in exchange rates since August 2015 when this budget was first proposed but has remained relatively accurate.
Total	4969	3803.49	2551.05	
Professional development – return flights from North Eleuthera – Tampa, FL.	0	464.78	464.78	Having communicated with Rufford regarding the residual funds, I have used some of them presented here to take advantage of a professional development opportunity to travel to the Florida Fish and Wildlife Conservation Commission to give a lecture series on this work and to discuss the next collaborative step in this project.



Book – Rays of the world	0	122.65	122.65	I used further funds to procure an
				upcoming publication. This book
				represents the first, and most
				comprehensive assessment of
				each and every 633 species of ray
				globally and will provide such a
				valuable tool for on-going
				educational efforts.
REVISED Total	4969	4390.92	578.08	

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

This work has not only demonstrated the very first comprehensive genetic assessment of this (data deficient) species, but has formerly identified the existence of a previously unrecorded species in The Bahamas. Therefore, there are several critical next steps:

- A recent publication (De Carvalho et al. 2016) reclassified this species from *Himantura* to *Styracura schmardae*, and has further reclassified it at the family level, from Dasyatidae (stingrays) to Potamotrygonidae (neo-tropical fresh water river rays of South America). This marks a really important evolution in our understanding of phylogenetic relationships and actually raises the question of 'where does the Bahamian population come from'? So, with that said, the next logical step would be to continue sampling in the broader Caribbean region, particularly those locales in proximity to The Bahamas, e.g. Cuba, Hispaniola, Jamaica to assess gene flow and speciation among a far wider spatial scale. This will help us understand how this species has propagated over spatial scales of hundreds to thousands of miles, instead of tens to hundreds.
- Furthermore, I want to apply similar genetic methodologies on the population level of this species and its sympatric counterpart, the southern ray. I currently have an MSc student beginning with me in February 2017 and we hope to begin this sampling with a view to eventually lead her into a PhD looking at this broad, Caribbean wide study.
- It would be very interesting to travel to the Amazon and collect genetic information from a range of the freshwater rays to see how long ago the radiation to marine systems (and presumably the newly reclassified *S. schmardae* and *S. pacifica*) took place and what drivers were potentially responsible for such evolution. This will help us understand the evolution of rays and can further provide a springboard to studying further 'obscure' species.



# 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 – I presented this work at two international conferences and a seminar/workshop, as well as several in-house and domestic science meetings, so The Rufford Foundation logo was used a total of seven times. Furthermore, The Rufford Foundation has been acknowledged in my recently accepted manuscript and will feature in all future publications arising from his work.

### 11. Any other comments?

This has been the most challenging yet satisfactory research project of my career to date. Many thank for your support.