Final Evaluation Report

Your Details	
Full Name	Michelle Marie Carpenter
Project Title	Discovery of Critical Sites for Endangered Shortfin Devil Rays
Application ID	32649-1
Date of this Report	31 May 2022

1. 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
Scientific research				All research activities planned for South Africa have been achieved. The results will be published as two papers, one on the sightings and cleaning behaviour, and a note on the mating behaviour of shortfin devil rays. The Rufford Foundation will be listed as a primary funder in each paper. These papers will be written in 2022 and published in 2023. The research activities in Mozambique could not be achieved due to lost data (5.5 hours of footage data), and the lack of a Mozambique study permit.
Educational talks at local schools				All planned school talks were delivered, with positive response from students, teachers, and parents. The impacts included pledges by students to clean beaches, to eat sustainable seafood, and to spread awareness about devil rays and the ocean.
Educational talks to the general public				Prior to an educational talk, less than 33% of attendees knew what a devil ray was. Following the talk, 100% and 93% learned something about devil rays and Aliwal Shoal, respectively. Almost all (95%) agreed that Aliwal Shoal is a hotspot for devil rays. Additional results have been outlined in the devil ray survey report attached.
Development of ecotourism				I surveyed people at random at the educational talks. 95% agreed that devil rays would influence their choice in diving at Aliwal Shoal. 100% would pay more money to try to see an aggregation of devil rays, although 81% would still dive at Aliwal Shoal if there weren't any devil rays. 100% agreed that devil ray diving could attract local tourism, and 93% agreed that it could attract international tourism. 74% answered that not enough

				management is being done to ensure the conservation of the species, and 79% answered that not enough research is being done. These results have been presented to each dive centre as an opportunity for devil ray ecotourism. A donation from each 'devil ray dive' will be given to the Oceanographic Research Institute (ORI) for further research on devil ray movements using acoustic telemetry. An additional donation from each 'devil ray dive' will be given to a local school to fund ocean educational experiences for the children.

2. Describe the three most important outcomes of your project.

a). First scientific study of cleaning behaviour and description of critical habitat for the shortfin devil ray, *Mobula kuhlii*, at the Aliwal Shoal Marine Protected Area, South Africa.

b). Increased awareness of devil ray biology, ecology, and conservation of school children and the general public in South Africa.

c). Development of an ecotourism model for diving with devil rays, to raise more awareness and money towards their research, conservation, and education.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

The major difficulty in this project was securing a study permit for Mozambique, something that was not explained by colleagues prior to applying to the Rufford Foundation grant. Further, the loss of promised data resulted in an exclusion of Mozambique from the project entirely. Had I known, I would not have included Mozambique in my application. COVID-19 amplified governmental administration issues in both South Africa and Mozambique (i.e., lack of answering the phone, lack of police clearance, response to questions, response to visa application). In South Africa specifically, the difficulties included COVID-19 restrictions, the July 2021 riots, and the April 2022 floods, all of which caused limitations of educational talks. These were tackled using online talk platforms such as Zoom, where I delivered six online talks to schools and the public. Fluctuations in dive prices were also a limitation, however, since I am a divemaster and dive guide, I was able to lead dives and conduct research at the same time, making dives sometimes free. Further, I was given in-kind support from many generous dive centres. I was able to conduct 368 research dives between 2020-May 2022. Even with several unforeseen events in South Africa, all activities within the country were still achieved because there was no reliance on documents from the government.

4. Describe the involvement of local communities and how they have benefitted from the project.

A total of 300 people attended public talks, with the majority (86%) being from South Africa and 14% from foreign countries (United Kingdom, Cyprus, Switzerland, France, Hungary, United States, and Spain). People were of diverse races and backgrounds, especially at the local school talks. Talk attendees have benefitted from an increased knowledge of marine biology, the value in animal tourism, and how to get involved in both. Dive centres benefitted from these talks by offering this education to tourists and surrounding communities. Marketing devil ray ecotourism will attract additional international and local tourists, which will benefit the community as whole, through increased tourism-related business. Especially as the local economy has collapsed due to the loss of tourism related to COVID-19. Dive and snorkel guides that are trained to give an educational dive briefing will gain more income per dive. Additional funds will be raised through this ecotourism for donations to a local school in exchange for a hand knitted mobula ray toy made by the teacher. These donations will fund ocean experiences (i.e., educational snorkel trips) for the children at the local school, who would not have been able to afford such experiences otherwise.

5. Are there any plans to continue this work?

Additional research dives will be conducted in order to ensure enough sampling effort in the winter months. Two film crews will join me at the end of 2022 and 2023 which will cause some delay in publishing the scientific papers as we will use updated, high-tech methodology to capture more data on the novel behaviours and describing the cleaning station. Prior to these films being released, the ecotourism model will be set in place by each participating dive centre. This is so that they are prepared for the surge in international tourism that will result from the films.

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

I have shared results throughout the duration of the project. Some results were shared in conference presentations (2021 WildOceans Steward Conference, 2021 Shark and Ray Symposium, 2021 Rufford Conference), online articles, radio interviews, podcasts (Tim Leary), newspaper articles (South Coast Rising Sun), Rufford-supported talks, social media posts, and in infographics shared with the dive centres (attached). I plan to share the full results officially as scientific papers. The films that will be released in a few years will also showcase some results with high-quality footage.

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

More than half (55%) of surveyed talk attendees wrote that more marketing and social media is needed when asked what more can be done to raise awareness about devil rays. Therefore, the next step is to ensure that the ecotourism and marketing model is set in place and practised by dive centres prior to international films being released. The dive centres will post facts about devil rays through their

platforms and secondarily attract tourists to possibly dive with them. Another step is to construct a YouTube Channel to spread awareness and promote tourism about Aliwal Shoal, using the videos I collected during fieldwork. In research, the next step would be to use acoustic telemetry to collect fine-scale movement data on the devil rays, which will help determine their movement patterns, and if there is connectivity between South Africa and Mozambique. With local schools, the next step is to provide a hands-on ocean experience for children who come from underprivileged backgrounds.

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

Yes, I used the logo in all materials and in publicity related to this work. The Rufford logo was used in conference presentations, public presentations, surveys, online articles, newspapers, and dive centre infographics. Further, The Rufford Foundation received publicity in online articles, newspapers, and podcasts. I referenced The Rufford Foundation in all social media posts related to the project. I presented at several conferences in which The Rufford Foundation was acknowledged as a primary funder. Going forward The Rufford Foundation will continuously be acknowledged in anything relating to my devil ray research as a thanks for the generous support. This includes future endeavours such as the YouTube Channel and other social media posts.

9. Provide a full list of all the members of your team and their role in the project.

Dr. Andrea Marshall and **Dr. Charles Griffiths** were academic supervisors in the project. **Sara Butchers** was the administrative officer, as the Chief Operations Officer of the Marine Megafauna Foundation. Because of the relative simplicity of the project with a modest budget, I could not hire regular team members on the ground. However, many divers, colleagues, and friends assisted with fieldwork and public outreach activities including **Summer Newton, Natalie dos Santos, Olivia Symcox, Kent Taylor, Tristan Wootton, Shannon Stewart, Romain Allemann, Nicki Gibson, Gary Snodgrass, Milley Obermeyer, Kyle Young, Tamara McArthur, Abby du Pois, Michelle Harvey, Yolanda du Pois**, and **Heinrich Potgieter**. Many colleagues also delivered additional public outreach talks following my devil ray talks on the same evening: Natalie dos Santos (sea turtle research), Summer Newton (shark education), Sendrina Naidoo (microplastics research), Shahir Ramesh-Ramndit (ocean acoustics research), Nico Booyens (human's whaler shark research), Candice Parkes (blacktip shark research), and Jan Solomon (the problems with offshore oil and gas).

10. Any other comments?

I want to thank The Rufford Foundation, particularly Jane Raymond and Simon Mickleburgh, for their patience and understanding regarding the difficulties that arose in this project, specifically, the Mozambique component. In future grant applications, I will triple confirm all aspects of the project prior to applying for a grant (i.e., data promised by collaborators, study permits). It has been a great pleasure working with the Rufford Team and I have learned a lot throughout this process.