Final Evaluation Report

Your Details	
Full Name	Israel Moreno-Barrientos
Project Title	Exploring the diversity of sharks and rays in mesophotic reefs along the central coast of Oaxaca, Mexico
Application ID	31712-1
Grant Amount	6000
Email Address	Israelmoreno59@gmail.com
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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
To produce a bathymetric map for the future location of new deep and mesophotic reefs.				We mapped approximately 70 km^2 of the Oaxaca coast. We identified priority sites such as coral reefs and small rockeries that may serve as aggregation areas for sharks
To adapt BRUVs to test the use of HD digital cameras at depths ranging 0 to 80 m.				Six BRUV units were built to carry out the work. Their design was specific for this study and for future research with pelagic and benthic organisms. We modified existing BRUV models to be fitted with HD digital cameras for this work.
To produce a photographic catalogue of Chondrichthyes associated shallow, deep and mesophotic reefs				Due to the oceanic conditions, obtaining high quality photos is very complicated, which is why very few photos were generated. We found that high quality videos are a good strategy; but the catalogue needs photographic expeditions to have quality pictures. We recommend complementing the catalogue the use of photos by another research.
Data generated from this project will serve as baseline for the study of deep and mesophotic reefs in the region.				I was able to complete my master's degree on science with a focus on conservation and the use of natural resources. In addition, within the next year a colleague from the laboratory will finish his Ph.D. also as a result of the support provided by this grant. The project sets baseline information that will drive the research of mesophotic reefs and the shark populations in the region, even along the Eastern Tropical Pacific
We will post at least two online notes to share the results during the lifespan of the project to increase awareness of the conservation of				Various publications were made on the personal and laboratory social networks by different members of the groups. I presented the results at two local congresses and gave a talk for the dissemination of science to the

Chondrichthyes				general public. In addition, a collaboration has just been finalised with the Program for the Approach of Science to Education to carry out talks with elementary, middle, and high school children during this year.
We will submit a scientific paper for publication in a peer-review journal.				We are currently working on the scientific article; we plan to submit it during the year and follow up on the comments of the reviewers. I wrote my MSc thesis in a "journal format", to make the process a little be faster.
A digital archive of videos and pictures for future research will be available			X	We generated 90 hours of high quality video recording. Video cameras recorded at least 90 target organisms (rays and sharks) and hundreds of other non-target organisms (e.g., fish and sea turtles). These videos will be useful for future projects.

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

Due to the health contingency resulting from the SARS-COV 2 pandemic, the times to go out to the field to collect data were greatly affected. Traveling to places of interest was complicated. We compiled information thanks to the coordination with fishers and tourism operators with whom they worked. We followed strict sanitary measures to prevent infections. Only a small group collected information. Data and video analyses were conducted at home by different team members. Due to these small groups, each member focused on specific tasks, so gathering a more significant number of photos was complicated.

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

- We recorded several species of the Batoidea group that have been poorly studied in the area (some species considered as endangered or data deficient according to the IUCN) and a significant absence of sharks in the region. Non-invasive or extractive methods gathered all data.

- Our study shows that some marine environments, such as sandy and rocky areas located at deep areas, such as mesophotic areas, have greater relevance for this group. Deeper and mesophotic reefs may be critical due to the intense fishing activity directed at rays and sharks. It is essential to take into consideration both the areas and the fishing activities for effective conservation strategies.

- We documented the importance of the areas with some degree of protection (Huatulco National Park) and the positive ecological effect in neighbouring areas without protection. In addition, we identified areas that

need protection due to their relevance not only for sharks and rays but also for marine biodiversity in general.

4. What do you consider to be the most significant achievement of this work?

5. Briefly describe the involvement of local communities and how they have benefitted from the project.

The local people with whom we worked were tourist operators who were previously dedicated to fishing, and also some fishers. They provided empirical knowledge of the area and reports of species that could previously be seen in those areas. They benefited from the experience by recognising the effect of fishing activities on shark and ray populations. They observed first-hand which species are found in their area, which is no longer present and protected by national or international regulations. Nowadays, they can provide this information to tourists for a deeper appreciation of the local fauna. In addition, the project represented an income during the critical pandemic situation since tourism was completely absent.

6. Are there any plans to continue this work?

Yes. I want to expand the study sharks and rays along the southern coast of Mexico. Non-invasive methods proved effective, but I want also to complement them using acoustic markers.

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

I have already given various lectures about the project and its results to the general public and students. I also participated in presentations at specialised congresses. We plan to continue disseminating the project on personal social networks, the laboratory Facebook page, and the institution where I did my master's degree. We will complement our efforts with outreach talks, scientific papers, and related academic events. On April 3 and 4, 2022, the project will be presented remotely at the 3rd workshop on Strengthening collaboration between fellows and actors of the Rufford Foundation in the Yucatan Peninsula.

8. Timescale: Over what period was the grant used? How does this compare to the anticipated or actual length of the project?

We estimated that the project would be completed in 1 year; nonetheless, the pandemic by COVID-19 extended its duration for over 2 years. I firmly believe that the project could be achieved at the anticipated time if conditions were not restrictive.

9. Budget: 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. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Gasoline for boats	1756	1756		NatGeo funds complemented the actual expenses for the total fieldwork
Field work	1720	1720		
Equipment	1674	1673	-1	
BRUV Materials	850	849	-1	
TOTAL	**6000**	**5998**	**-2**	

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

I believe that research efforts should focus on observed organisms that have a significant degree of threat, such as *Rhinoptera steindachneri*, which has been little studied in the Mexican Pacific. In addition, I pretend to replicate the project offshore (> 5-10 nautical miles) to determine what species of sharks remain in the locality, how far from the coast (a symptom of an intensive fishery), and the use they give to the coast Oaxacan.

11. 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?

I used the logo of the Rufford Foundation during each of the talks and congresses I attended. It was presented on the first and last slide of the presentation. I also used it during the defence of my master's degree thesis. We will use the logo and give our thanks at the acknowledgement section in papers.

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

Miguel Ángel Perez Castro (Ph.D. Student) He has more than 14 years of experience in scientific and recreational diving, which he used for his B. Sc. and M. Sc. This experience was used on occasions where there were problems when recovering the BRUV; he served as a team guide to recover the material. In addition, he was of great help in obtaining data for the benthic characterization, especially in sites with the presence of shallow, deep, and mesophotic reefs in the study area. Furthermore, these data will be of great use to your Ph.D. His help was also critical when handling the BRUV equipment, from arming, disarming, and recovering it after the recording.

Gabriela Ang Montes de Oca is an M.Sc. Local who has had a lot of experience in conservation projects on the Oaxaca coast working with NGOs like Costa Salvaje and now independently. Gabriela is a local collaborator, and she helped us collect and record inorganic parameters in the places where the BRUV launches were made. In addition, she was part of the diving team together with Miguel to characterize the benthos.

Jozh Iboga Local collaborator and student of Marine Biology at Universidad del Mar, located in one of the study areas (Puerto Ángel). He helped with the management of the equipment its recovery and provided general support to the rest of the team.

The different fishers and boat captains were of great help to this work; we were able to take advantage of their empirical knowledge, strengthen collaboration ties that had already been initiated in previous projects and generate new ones for future work in the area.

Gustavo Hinojosa Arango and Fernando Gumeta Gómez Provided guidance for the development of the project.

13. Any other comments?

The project was developed in part during the global pandemic. However, I think we managed to carry out the work, and the results that have been obtained and those that are missing make us very happy. They will be of help at a local level to show the current situation in the area at a national and international level, unfortunately very similar to what other authors have observed in areas with a loss of diversity. The project marks a start in the use of new tools for the area and the study of mesophotic ecosystems, which had not been studied in the area and have little interest in other regions of the world.