The Rufford Foundation

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	Gustavo Cárdenas Hinojosa
Project title	Reducing bias in monitoring the population trends of the most critically endangered marine mammals of the world: the vaquita (*Phocoena sinus*).
RSG reference	13319-1.
Reporting period	August 2013 to July 2014
Amount of grant	£4891
Your email address	gcardenas03@gmail.com
Date of this report	July 10th 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
Field surveys in the Refuge of the Vaquita to collect acoustic signatures.			X	Despite the general delay in the project (see question # 2), we did all the field surveys planned, and we did one extra field survey to collect more acoustic data.
Description of the main acoustic features of the acoustic signatures collected during the field surveys.		X		This objective was partially achieved, because the software was not able to do the visualisation of the noise produced by boats (trawlers and pangas). However, the noise produced by wind and tidal changes conditions, and the vocalisations of two species of dolphins, the bottlenose dolphin and long-beaked common dolphin, were acoustically recorded. Therefore, the description of the main acoustic features of these signatures acoustic (click events) was done.
Review and acoustic assignment of the acoustic signatures collected in this project in the data of the acoustic monitoring of vaquita.			X	Instead of review a sample of the data collected of the acoustic monitoring of vaquita of 2011 and 2012, we reviewed the full data set of 2013 of the monitoring of vaquita to increase the size of sampling. During the review, we did the acoustic assignment of the different acoustics signatures in the software of the acoustic detector. The data set of 2013 consisted of 3,013 whole days recorded by 43 acoustic detectors.
Effects of dolphins and other sound sources in the acoustic behaviour of the vaquita			X	We did the temporal correlation between the (dpm) detection positive minutes of vaquitas and dpm of the different noise sources (dpms are minutes of C-POD recordings that contained at least one click train). The results showed a correlation of the high acoustic rate of vaquita, and the noise produced during the high tide. The results showed also that the sediment transport noise created by wind and tidal change does not affect the acoustic rate of vaquita. Furthermore, similar to other species of porpoises, the presence of dolphins had a negative effect on the acoustic presence of vaquita.

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

I had two unforeseen difficulties: a). Delay of the beginning of the field surveys. I planned to start the surveys in July 2013, but the money was transfered on July 23rd. I started the field effort in August 2014; b). The outboard motor broke down two times. I had to fix the outboard motor in September 2013 and in January 2014. This occasioned delay in the field trips, data analysis, and report. The last survey was done in March 2014, and it was planned to be done in November 2013. It was tackled by working extra time to analyse the data.

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

a. The recordings of the different noise sources in the field and the description of its acoustic features. This allowed us to do the acoustic assignment in the 2013 data of the acoustic monitoring of vaquita and to do the temporal correlation between the acoustic detection of vaquita and the acoustic presence of dolphins and other sound sources. Despite these important results, we think it will be needed to analyse the acoustic data collected during 2011 and 2012 for the vaquita monitoring, to get more robust and accurate correlations in order to estimate the bias occasioned by these noise sources in the acoustic rate of vaquita to include them as a parameter in the model of the assessment of the population trend of vaquita. This in turn, will allow us to be able to advice the Mexican Government if the recovery programme is in the correct track or needs to be intensified, adapted or modified immediately.

b. The acoustic recordings of the bottlenose dolphins and long-beaked common dolphins. The acoustic assignment of the dolphins in the data of the vaquita monitoring, resulted also in a database to study the occurrence and distribution of these animals during the summer 2013 in the Refuge of the Vaquita.

c. Cetacean sightings. We recorded visual encounters of baleen whales (humpback whales and Bryde´s whales), vaquita, and dolphins in the Refuge of Vaquita. During the encounters, we collected photographs of the dorsal fin of the different cetaceans sighted. This data (sightings and photo id) represents an updated of the occurrence of cetaceans in the Refuge of Vaquita, which is part of the Biosphere Reserve of the Upper Gulf of California & Delta of the Colorado River.

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

During some of the navigations to the Refuge of the Vaquita, were involved as marine mammal observer's two local persons that are personnel of the Biosphere Reserve of the Upper Gulf of California and Colorado River Delta, and only two local (San Felipe) fishermen involved as boat operators. They were trained in the species identification of cetaceans.

5. Are there any plans to continue this work?

There are no plans to continue with the field work to collect more acoustic data but there are plans to continue the analysis of the acoustic data. I will review and re-analyse the acoustic data collected during 2011 and 2012 from the acoustic monitoring of vaquita to do the assignment of the two acoustic signals of dolphins described in this project. This exercise will allow us to get a largest

database of acoustic signals, and we will be able to do more robust statistical analysis of correlation between the temporal acoustic activities of vaquitas and the temporal presence of dolphins. Furthermore, the results of this project will allow us to do the acoustic assignment of dolphins (and other sound sources recorded in this project) while we will do the acoustic assignment for vaquita during the next acoustic monitoring of vaquita of 2014 and 2015.

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

The preliminary results were already shared in the Second Workshop of the Steering Committee of the Acoustic Monitoring for Vaquita held in Ensenada, B.C.S., México from April 23rd-24th 2014. The meeting with the attendance of national and international researchers.

Since this study only included the analyses of the acoustic data of the 2013 monitoring of vaquita, I will do the same for the 2011 and 2012 data. After this, I will submit the work to some scientific journal to publish the results.

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

I used the money of the RSG in a period of 8 months for the field activities. Because the delays mentioned in question # 2 of this report, the length of the project was longer to the anticipated. I planned to send the final report in April, and it was sent by July 2014. Therefore, the length of the project was 1 year.

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
Acoustic detector (CPOD)	1045	1045		
Field surveys in the Refuge Area for the Protection of the Vaquita	1708	1708		During the five field surveys planned and done in the project, we were unable to navigate six days because rough sea conditions. This allowed me to save money (£408) in fuel for navigation, and allowed me to do one extra field survey to collect more data. I did not present differences in the next items, because I used the saved money to pay for four days of per diem and three days for fuel for navigation in the extra field survey.
Transportation from Ensenada to San Felipe	278	334	+56	Since I did one extra field survey, it was necessary to go again to San Felipe. The difference was covered by my institute.

Per diem for lodging and food in San Felipe	1582	1582		
Mooring system to deploy C-Pod in the sea bottom	278	278		
Total	**4891**	**4947**		

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

The next steps are:

1. I will review and re-analyse the acoustic data collected during 2011 and 2012 from the acoustic monitoring of vaquita to do the assignment of the two acoustic signals of dolphins described in this project, and other noise sources recorded. This exercise will allow us to get a largest database of acoustic signals and we will be able to do more robust statistical analysis of correlation between the temporal acoustic activities of vaquitas and the temporal presence of dolphins. Furthermore, the results of this project will allow us to do the acoustic assignment of dolphins (and other sound sources recorded in this project) while we will do the acoustic assignment for vaquita during the next acoustics monitoring of vaquita.

2. With the information mentioned above, we will be able to introduce the bias occasioned by the presence of dolphins in the acoustic detection of vaquita as a new parameter in the statistical model to estimate the population trends of vaquita. This knowledge is key to reduce the potential bias in the first estimate of the population trend of vaquita from data of 2011 to 2015. The estimation will be critical to be able to detect small population changes in the short term (5 years) to be able to advise the Mexican Government if the recovery programme is in the correct track or needs to be intensified, adapted or modified immediately.

3. To create a database of the acoustic presence of the bottlenose dolphins and long-beaked common dolphins to study the distribution and movements in the Refuge of Vaquita of these animals during the summers of 2011, 2012 and 2013. Moreover, the results of this project also are baseline for a long-term monitoring of dolphins in the Refuge of Vaquita since the acoustic monitoring effort for vaquita is planned to be of at least 15 years.

4. During the navigations, we recorded an outstanding number of visual encounters of baleen whales (humpback whales and Bryde´s whales) and dolphins for the area. The last scientific paper about presence of cetaceans in the northern Gulf of California is of the end of the 1980s. This reason encouraged me to look for grant support to continue search effort to record the presence of these animals and to get more photos to increase the photo-identification catalogue resulted of this project. The sightings and photo-id will allow me to know current ecological aspects of the cetaceans of the Refuge of Vaquita as distribution, occurrence, site fidelity, and use habitat.

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 used The Rufford Foundation logo in the first slide of the power point presentation that we had during our meeting in Ensenada, Baja California (April and July 2014 mentioned in question # 6). At the end of the presentation (slide of acknowledgments) I thanked to the grant approved to me to from RSGF, and I wrote the main webpage http://www.rufford.org/. Furthermore, from June 24th-

26th 2014 was held a workshop in La Jolla, California, to estimate the trends in vaquita acoustic detections from the first three seasons (2011-2013) of the acoustic monitoring programme. The assistance in this workshop consisted of international experts on spatial models. Despite in this workshop not was included the preliminary results of this project, in the acknowledgements section of its reports was thanked to the RSGF for grant supporting for this project related to the vaquita research.

11. Any other comments?

I am very grateful to the RSGF for the support and confidence to the performance of this project. The grant was very important to collect data on the wild of different sound sources, and as a result we got a baseline study to increase the knowledge mainly of the potential correlation between dolphins and vaquitas.