

## Final Evaluation Report

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Your Details	
<b>Full Name</b>	Diane Gendron
<b>Project Title</b>	Accessible remote monitoring of blue whales and the new passive whale watching activity in the Loreto Bay National Park, Mexico.
<b>Application ID</b>	29792-D
<b>Date of this Report</b>	August 29 <sup>th</sup> 2023

**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
Installing and testing IP camera system with an Internet service provider.				A contract for internet connection services to live stream was made.
Installing video screen for public viewing				The video screen was acquired, and the metal mounting was modified for wall installation, which restricted the public viewing period to the end of the season.
Develop and test a YouTube channel and web page for public Internet viewing				The real time transmission was good. We managed to stream via YouTube for an average of 4.5 hours per day for 20 days, depending on the wind.
Training volunteers to remotely monitor and record behaviour of blue whales and WW activity.				The remote monitoring using a Vivotek programme in 2021 was a real success considering the pandemic. Two students, one based in Mexico City and the other in La Paz split the monitoring (morning/afternoon) during a total of 43 days (96 hours) and have recorded 26 hours of video with whales and/or with WW boats. During 2020 a total of 232 hours were monitored with 31 hours of recording on site.
Field trips at sea conducting the focal blue whale individual surveys to monitor diving behaviour and the body condition of the whales and to collect biological samples.				We completed both 2020 and 2021 field surveys. A total of 41 individual were photo-identified during our focal surveys, and biological samples and aerial photographs were obtained.
Updating and evaluating the body condition index from photographs taken at				A total of 21 individuals were vertically photographed using the drone and were included in the new body condition index developed by

sea. Also assessing morphometric analysis from aerial photographs.				a Master's student.
Revising data of achieved video for blue whale behaviour and WW activity.				The diving behaviour of whales and WW boat interactions were analysed from recordings made during both 2020 and 2021 and was part of a Bachelor thesis.
Technical report of the web page and YouTube channel traffic for the park managers and blue whale WW service providers				A report was sent to the park manager .
Helminth egg analysis from feces samples				31 faecal samples were analysed for helminth eggs and protozoa. 91% of the samples showed multiple infections with both parasites. The protozoa were <i>Entamoeba</i> 60%, <i>Balantidium</i> 58% and <i>Giardia</i> 55%, which are normally found in humans.
Post-season meeting to discuss and evaluate monitoring system				On June 18, 2021, we organised a mixed in-person/virtual meeting with a total of 24 attendees from 11 WW companies at the National Park office to evaluate the monitoring at sea and with the IP camera.

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

This report includes the 2020 and 2021 field season. Despite the pandemic context our objective were 100% achieved.

**a).** Live transmission from the IP camera. This objective was achieved with 95 hours of livestream across 20 days (January 27<sup>th</sup> to April 9<sup>th</sup>) via a YouTube channel. A total of 781 people were registered viewing the live transmission with a mean of 36 people per day. From this we concluded that it is possible to livestream the camera video via Internet.

**b).** Remote monitoring online. Using Vivotek software, the remote monitoring was a real success, especially considering the constraints imposed by the pandemic. The monitoring of whales and WW activity were made by two students based in different cities (Mexico and La Paz) and provided enough data for completing a Bachelor thesis. The results showed that the diving behaviour variables (surface and dive time and number of blows) were similar to the field survey method. We concluded that this remote monitoring method is a viable independent monitoring method.

c). New index of body condition. Using a Phantom 3 drone, aerial photographs of 21 individuals were obtained from which different areas of the body were measured and a Bayesian generalised linear regression of the most variable area as a function of total length was performed. The individual residuals from this regression were used as the body condition index, data from which was comparable to the visual body condition index of the same individuals developed in previous years.

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

A contract for Internet connection services was made in 2021 to transmit live IP camera video from the API installation in Puerto Escondido. However, the continuity and velocity of the signal was highly variable, and the provider was generally very slow to fix the problems. This prevented livestreaming during the whole season as planned, but we still achieved 20 days of live transmission.

The metal mounting of the video screen had to be modified to be installed on the wall of the API Loreto building, a position chosen for safety and because it is well situated at the WW tour boarding entrance. The modification took some time to complete, so only few days of the livestream at the end of the season were viewable on the screen.

To summarise, the camera system may be used for monitoring (moving the camera and recording) the WW activity directly from the antenna reception site and via the online program Vivotek. Now it can be livestreamed to a YouTube page and to the video screen installed at the WW tour boarding entrance. Unfortunately, the existing internet system in the Loreto town is very slow due to yearly increasing demand and this has caused slow engaging of the community social network. We understand the municipality is working on implementing a faster system, which will permit easier access to observing the activity in real time, which in turn will greatly benefit the local community.

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

The WW companies are very interested in the publicity of their WW tours using the passive method. The YouTube channel livestream has promoted the presence of blue whales in the area and although for a short time, it has been useful to show, in real time, the new passive method to observe the whales in this natural protected area.

As with every year, we organised a meeting with the WW captains and the director of the Loreto Bay National Park after the season to share our investigation results and experiences. On June 18, 2021, we organised a mixed in-person/virtual meeting at the national park office to evaluate the monitoring at sea and with the IP camera, and the whale's body condition. Many captains asked for a continuation of the workshops on the passive method, which we believe should be scheduled for the next couple of years to maintain the current procedure between all users and facilitate improvements or other developments.

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

During late 2021 season, we found out that the infrastructure at API Puerto Escondido where the reception antenna and internet connection were made had been completely demolished. This was a shocking and very disappointing discovery, and the reason why this report was postponed. After some months of reviewing possible new sites for the antenna connection, I initiated talks with the new director of the Loreto Bay National Park. He was of the opinion that this project needed to continue, and so together we approached the Puerto Escondido Marina directors to come up with a plan for a solution. We requested the use of their building, to install our antenna and test the connection. Fortunately, the directors of the Puerto Escondido Marina were very interested in helping, and even offered the use of their new internet system connection at no cost. An agreement was signed. The installation of the antenna and Internet connection were tested and worked very well. The inclusion of specifically this local business assures future continuity and the ongoing success of this project.

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

During the 2021 season, a press conference on the new installed internet livestream of the IP camera, was held in Loreto to share with the community. Several local and state TV and Newspapers attended and were informed on the passive method to observe blue whales and the new livestream camera was publicised. The Rufford Foundation was acknowledged.

Several studies were developed during this project in form of thesis, scientific publications and presentations in conferences. Here is a list that also includes Rufford Foundation acknowledgements.

### Scientific Publications

Mondragon-Neri, G.A, Gomez-Gutierrez, J., Garcia-Fernandez, F, Gendron, D., Busquets-Busquets-Vass, G., Robinson, C.J. (2023). Ontogenetic social behavior and seasonal abundance of the subtropical krill *Nyctiphanes simplex* in northwestern Mexican waters. *Journal of Plankton Research*. 45(3) 421–439. <http://doi.org/10.1093/plankt/fbad008>

Ortega-Ortiz C.D., Mata Cruz R.M., Gerrodette T., Gendron, D. (2022). A photogrametric method to estimate total length of the largest mammal, the blue whale (*Balaenoptera musculus*). *Mammalian Biology special issue "Individual Identification and Photographic Techniques in Mammalian Ecological and Behavioural Research – Part 1: Methods and concepts*. doi: 10.1007/s42991-022-00307-6

### Thesis

Macias Torres, S.V. (2022). Monitoreo del efecto de la actividad turística de observación de la ballena azul (*Balaenoptera musculus*) mediante el uso de una cámara remota en el Parque Nacional Bahía de Loreto. Tesis de Licenciatura, Universidad Autónoma de Baja California Sur. 5 Septiembre 2022.

Corona Melendez, C.A. (2021). Contenido de Aluminio y Titanio en heces de ballena azul (*Balaenoptera musculus*) y su potencial como indicadores indirectos de la variabilidad climática. Tesis de Maestría, CICIMAR-IPN. 24 Agosto 2021.

Arcos Diaz, J. (2021). Evaluación de la condición corporal de la ballena azul en el Golfo de California: Índices visual y fotogramétrico. Tesis de Maestría CICIMAR-IPN. 18 Enero 2022.

Delgado Rodríguez, J.V. (2022). Composición en la dieta de la ballena azul del Golfo de California mediante la escatología molecular. Tesis de maestría, CICIMAR-IPN 12 agosto 2022.

Gómez de Santiago, C. (2023). Análisis de comportamiento y de asociación de ballenas azul hembras (*Balaenoptera musculus*) en el Parque Nacional Bahía de Loreto, México. Tesis de maestría, CICIMAR-IPN. 24 Julio 2023

Dominguez Sanchez, C.A. (2020). Caracterización del microbioma del tracto respiratorio de la ballena azul (*Balaenoptera musculus*), en el Golfo de California. Tesis de Doctorado Universidad Autónoma de Querétaro. 22 enero 2021.

**XXXVII Reunión Internacional para el estudio de los Mamíferos Marinos del 2 al 6 de mayo de 2021.**

Gendron, D. 2021. Conferencia Magistral "Historia positiva en torno a la observación de ballenas: un método científico que se transformó en una actividad sustentable".

Pacheco A.M.J., Morales A.J.R., Leyva V.I., Gómez Gutiérrez J. y D. Gendron. 2021. Identificación morfológica y molecular de endoparásitos de la ballena azul de vida libre en el suroeste del Golfo de California

Corona Meléndez, C.A., D. Gendron y A. Martínez López. 2021. Contenido de elementos mayores en heces de rorcuales y su potencial como indicadores indirectos de la variabilidad climática

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

Continue monitoring the WW activity to ensure the long-term sustainability of this activity, as well as monitoring use of the area by other boats (sport fishing fleet). Live stream the video from the IPCamera in our YouTube link. We also think it is important to continue the monitoring of the body condition of the whales and assess the impact on pregnancy and reproductive rates using steroid and stress hormones assays from our + 20 years blue whale faeces collection. The steady declining of the whale's body condition needs to be monitored and possible sources of this decline should be investigated. General stress and nutritional stress may be measured through hormone assays.

**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?**

In all presentations that were partially funded by The Rufford Foundation, the Rufford Foundation logo was included. In scientific publications and theses, Rufford Foundation was listed in the acknowledgments. See list in 6. The YouTube page has the sponsor's logo of The Rufford Foundation.

(<https://www.youtube.com/@monitoreoremotodelavidamar9421/streams>).

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

**Dr Rocio Marcin Medina**, director of AICMMARH, A.C. organization of the meeting

**Dr Diane Gendron**, director of the project

**MS. Ricardo Mirsha Mata Cruz**, Coordinator researcher in charge of directing the IP camera system monitoring project.

**Salma Macias Torres**, bachelor thesis comparing diving behaviour from remote camera IP and field surveys in the Loreto Bay Nacional Park.

Jasivi Arcos Diaz. M.S. thesis. Development of a new body condition index through aerial photogrammetry.

**Cecilia Gomez de Santiago** M.S. thesis. Analysis of behaviour and social network within reproductive states of female blue whales in the Loreto Bay Nacional Park

**10. Any other comments?**

The Loreto Bay Nacional Park, a natural protected area, has just been included in the "IUCN Green list" partially due to the involvement of the community in implementing the new method of observing blue whales, which was promoted through The Rufford Foundation projects. Many thanks for your help in the development and promotion of this method.