Final Evaluation Report

Your Details	
Full Name	Andrea Bonilla Garzón
Project Title	Acoustic Behaviour of Humpback Whale G Stock in Breeding and Feeding Areas within a Year
Application ID	26884-1
Grant Amount	5000 £
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Date of this Report	Dec 17th, 2021

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
Identify sound sources in the study area and evaluate if anthropogenic sounds influence the whales' acoustic behaviour.			■	After almost 3 months of fieldwork in breeding and feeding areas, we could identify different sources of sound: natural, biological, and anthropogenic. Those signals were compared with the surrounding noise. Humpback whales were more common in breeding areas than in feeding areas. Circumstances in feeding areas were out of the ordinary; the Covid-19 pandemic affected the human presence in the area. If well, it is not an ideal scenario to study noise impact. It is an incredible opportunity to establish a comparative point with incoming years and the human activities coming along in the area.
To do visual surveys looking for cetaceans in the study areas.			■	In Colombian waters: A team of four people conducted 21 days of visual and acoustic surveys. We visited three different locations on the Pacific coast of Colombia. The daily effort was about 8 hours. In Antarctica: Andrea Bonilla was approved to participate in the VII Colombian Expedition to Antarctica in collaboration with Ecuador. The project was held in the Ecuadorian Antarctic Station "Pedro Vicente Maldonado" for 55 days. Visual and acoustic surveys were carried on board a small boat and were dependant on the weather conditions.
Obtain acoustic records of HW in Colombian waters and The Antarctic.			■	In Colombia, a total of 41 recordings were obtained. We obtained those recordings under different conditions of noise.

				In Antarctica, a total of 28 recordings were obtained. We took those recordings under various weather conditions and cetacean presence.
Describe the acoustic landscape identifying sound sources: biologic, natural, and anthropogenic in the study areas.				A total of 69 recordings are under analysis. At the moment, I have identified different kinds of sounds: biological, including humpback whales, birds and minke whales, among others. Anthropological sounds include stationary or in transit ships, small boats, and fixed structures deployed in the water. Natural sources of sound include rain, ice cracking, wind, etc.
Identify vocalizations of HW in breeding and feeding areas.				At breeding areas, we have recordings of humpback whales present every day. We recorded three different types of grouping: mom plus calf, solitaires and, 3+ groups. In feeding areas, the scenario was very different; humpback whales were very scarce. We spotted the species just once, and the number of vocalisations obtained was minimum.
Establish noise to signal ratio for the HW vocalization.				In breeding areas, this analysis was possible because of the high number of vocalisations from humpback whales that we obtained. Otherwise, this analysis was restricted in Antarctica because of the low presence of animals and scarce human presence due to the Covid-19 pandemic.
Identify noise levels and acoustic threats for HW in the study area.				We could obtain a good idea of the typical soundscape at breeding areas' beginning of the touristic season. Due to Covid's impact on Antarctic tourism, the noise level and human presence were minimum. Probably we could not obtain a "regular" soundscape of the area. But definitely, this season is a crucial point of comparison with years with regular transit of touristic ships.

Evaluate human interaction with whales in the study area.				We obtained a good idea of the regular human/whale interaction at the beginning of the whale watching season in Colombian waters. Due to Covid's impact on Antarctic tourism, the noise level and human presence were minimum.
Share the results with the maritime authorities, Colombian NGOs, and international institutions related to whale conservation.				We shared our results through conferences and symposiums with the Colombian Commission of the Ocean in Colombia and the INAE from Ecuador. Also, one student had a presentation at the National University of Colombia, and she is using this data for her undergraduate thesis.

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

1. The methodology proposed for breeding areas included deploying stationary hydrophones attached to an anchorage system and a buoy in the surface. However, in our first location in Colombian waters, the ocean floor conditions and depth in nearby areas were not ideal, deployment with the anchorage system designed was not suitable. Finding a solution for this problem, we created a way to attach our stationary hydrophone to a navigation buoy in the area. After 2 days of the attachment working correctly, a storm happened during the night. The strong winds, current, and waves made the buoy rotate significantly. The movement destroyed the attachment system, and the hydrophone got lost. We didn't expect to lose a piece of equipment and data during the 1st week of fieldwork because of weather and oceanic conditions.

2. In 2019, the CCO approved the project as part of the VI Expedition Colombia to Antarctica. Spain station gave us a place for a month for the project to be held in December 2019 and January 2020. Logistics didn't work out, and we couldn't find a ship to transport me from Chile to Antarctica. My participation in the Antarctic Expedition in 2019 was cancelled because of logistic issues.

3. In 2020, my project was approved by the CCO and earned a place in the VII Expedition Colombia to Antarctica. This time it was under the modality of international cooperation with Ecuador. It was held in the Ecuadorian Antarctic Station "Pedro Vicente Maldonado."

   Being part of an Antarctic expedition in the middle of a pandemic was a privilege and a big challenge. I was quarantined in a costly hotel for 14 days in Punta Arenas, Chile. The most significant impact on my project occurred when Covid arrived in Antarctica, specifically at the King Georg Island airport.

My departure flight was pushed back for 21 days. It became a big logistic challenge.

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

- Bioacoustics research in Colombia is very scarce. This project was the first time a study had a comparative scope in Colombian waters. We included three different locations under three different levels of human impact. This project will set a baseline for future research in Colombian and in the knowledge of the acoustic behaviour of humpback whales of the stock G.

- Going to Antarctica during the pandemic due to Covid-19 was a huge privilege. Most of the countries and national Antarctic programmes cancelled their expeditions. We got recordings under exceptional circumstances in the Southern Ocean. Setting a baseline to compare with a "regular" year is almost impossible, and we did it during this austral summer.

- The fieldwork and part of the analysis included two biology students from Colombia. This project worked as a platform to build skills and human capabilities. I trained those students in methodology for visual surveys for marine mammals, taking pictures of cetaceans, data management, photo-id, and acoustic analysis. One of them developed her undergrad honoured thesis with data from the project.

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.

During the fieldwork in breeding areas in the Colombian Pacific, we worked closely with local communities. In the three locations, we created some income for them. We rented boats and stayed in houses/hostels of locals. We worked with captains who also work in whale watching during the breeding season. While sharing time with us and being part of the project, we gave them some basic information about whales to improve the quality of the information they provide to tourists while whale watching activities.

In the hostel in Bahía Solano, we left a poster as a gift. It had some information aimed to inform future guests about the project.

In Bahía Málaga, we taught one of the leaders of the tourism organisations how to use and deploy a hydrophone. He was very interested in including sounds as part of his tours. He owns a hydrophone now and, he uses it as a new feature to the service he offers during whale watching.

6. Are there any plans to continue this work?

Yes, absolutely!

This project made me notice all the potential both areas have to offer. And all the questions that remain to be answered. Part of our long-term goals are listed below:

1. Establish long-term acoustic monitoring of cetacean species in the Colombian Pacific.

2. Include the touristic sector in the project by offering training, meetings, and outreach activities.

3. Deploy long-term hydrophones in breeding and feeding seasons. Establish this project as a long-term monitoring program.

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

Sharing our project, goals, and findings with scientific and non-scientific communities is essential. The outreach activities with the non-scientific community will include talks, meetings and, forums with locals. For the following stages of the project, we will create spaces to share our findings and goals while we are doing fieldwork.

As part of the plan to share our findings with the scientific community, we will participate in scientific meetings and conferences. We plan to go to the 19RT-Solamac postponed due to Covid-19.

We have done talks in universities and participated in several events organised by the Colombian Antarctic programme. Product of this project a student did her undergraduate thesis. That document will stay in the repository of the National University of Colombia. Her work was presented in the IV Colombian Conference of Mastozoology held in November 2021. We also plan to publish at least two scientific papers.

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

We planned to use the grant in less than one year. In the end, we accomplished the goals in 2 years, from July of 2019 to March 2021. Delays were caused mainly for the challenge in terms of logistics to prepare and develop an Antarctic expedition. The Colombian Antarctic programme worked tirelessly to establish partnerships and collaboration between countries and ensure places on ships and stations in Antarctica. However, Antarctica is tough to access and requires high adaptability to plan changes.

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
Boat rental	546	1038	-463	We rented small boats for fieldwork in Colombian waters and paid for their fuel. The expense was less than expected because the work was almost stationary in the last location.
Fuel	955			
Waterproof cases	100	119	+19	Pelican Case for electronics and devices
Food and lodging	1029	1824	+795	Colombia. Also, it includes expenses of a mandatory quarantine in Punta Arenas, Chile (Expense unexpected when planning the budget)
Airfares	500	845	-345	Between Colombian Locations for two researchers
Acoustic equipment	190	164	-26	Hydromic A/D converter and an Extra recorder were lost in the first location
Camera	520	407	-113	Less than expected, I found a deal
Lenses	520	407	-113	Less than expected, I found a deal
GPS	70	72	+2	
Binoculars	114	108	-6	
Range-finder laser	114	124	+10	
Anchorage system	340	195	-145	I found a local retailer, which made the expense less than expected.
Medical Clearance and tests		56	+56	
Airfare Mexico - Punta Arenas to take the ship		530	+530	
Mandatory Quarantine in Punta Arenas before travel		200	+200	

back home country				
Gear for Antarctica		60	+60	
Covid testing		54	+54	
Health Insurance for Antarctica		125	+125	
Total	**4998**	**6328**	**+1330**	**Co-funding**

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

We want to establish a long-term passive acoustic monitoring programme in feeding and breeding areas. The deployment of an acoustic device with enough autonomy dynamics and changes in the soundscape, human activities, and other sources of wildlife disruption.

It is crucial to include locations under different human impact levels in breeding areas. As we did in this study, we can compare the species' acoustic behaviour in terms of what level of impact an area has.

We want to strengthen the project's community engagement and outreach with the local population in coastal areas in Colombia. To enrich the locals ' touristic guides, I want to plan a workshop on good practices and general knowledge of humpback whales. The outreach will be mainly directed to national Antarctic programmes and tourists in feeding areas.

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?

Yes, the RF logo was included in all talks, courses, training, or meetings where results/methods were exposed. Also, The Rufford Foundation was mentioned in the acknowledgement section of every product shared with others.

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

Andrea Bonilla. I worked in the pre-project phase to define goals and plan the project. I was in fieldwork in Colombian waters, collecting all data needed. I worked in the acoustic analysis with the recordings. I went to Antarctica during the Austral summer 2020-21 to gather recordings, photos, and visual surveys of marine mammals' presence.

Lorena Viloria. She participated in the fieldwork trips done in Bahía Solano and Bahía Málaga during July/20. Her experience of more than 15 years working with marine mammals was invaluable in this pilot project to solve the unforeseen difficulties that popped up.

Angie Murcia. Biology student at the National University of Colombia. She participated in the fieldwork trips done in breeding areas (Bahía Solano, Bahía

Málaga and Tumaco). After fieldwork, she analysed the recordings as part of the Bachelor thesis called "Analysis of the humpback whale song and its variation in three locations in the Colombian Pacific at the beginning of the breeding season." She developed her undergraduate thesis with 100% data obtained in this project. She is also writing a paper including the result of her dissertation.

Camila Salazar. Biologist of the National University of Colombia. She participated in the fieldwork trips done in breeding areas (Bahía Solano, Bahía Málaga and Tumaco). After fieldwork, she has shown interest in working on data collected.

Others: If not part of the research team, the following people contributed to the development of fieldwork:

- Colombian Pacific trips: **Jimmy Bahía Solano, Leonardo 'Captain', Don Samuel e hijo (Bahia Malaga), Lili hostel, Capitán de Fragata Carlos Andrés Martínez Ledesma, Capitán lancha de la Armada.**
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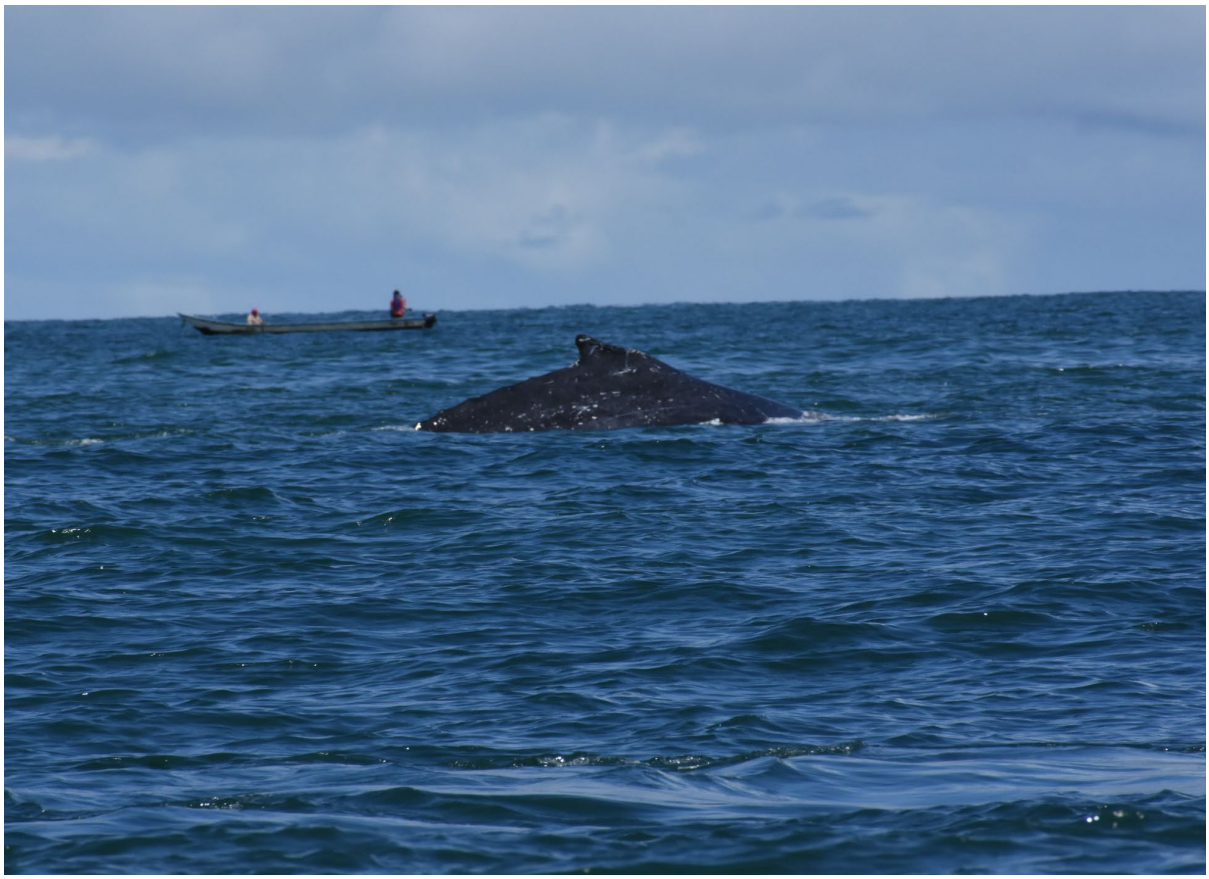
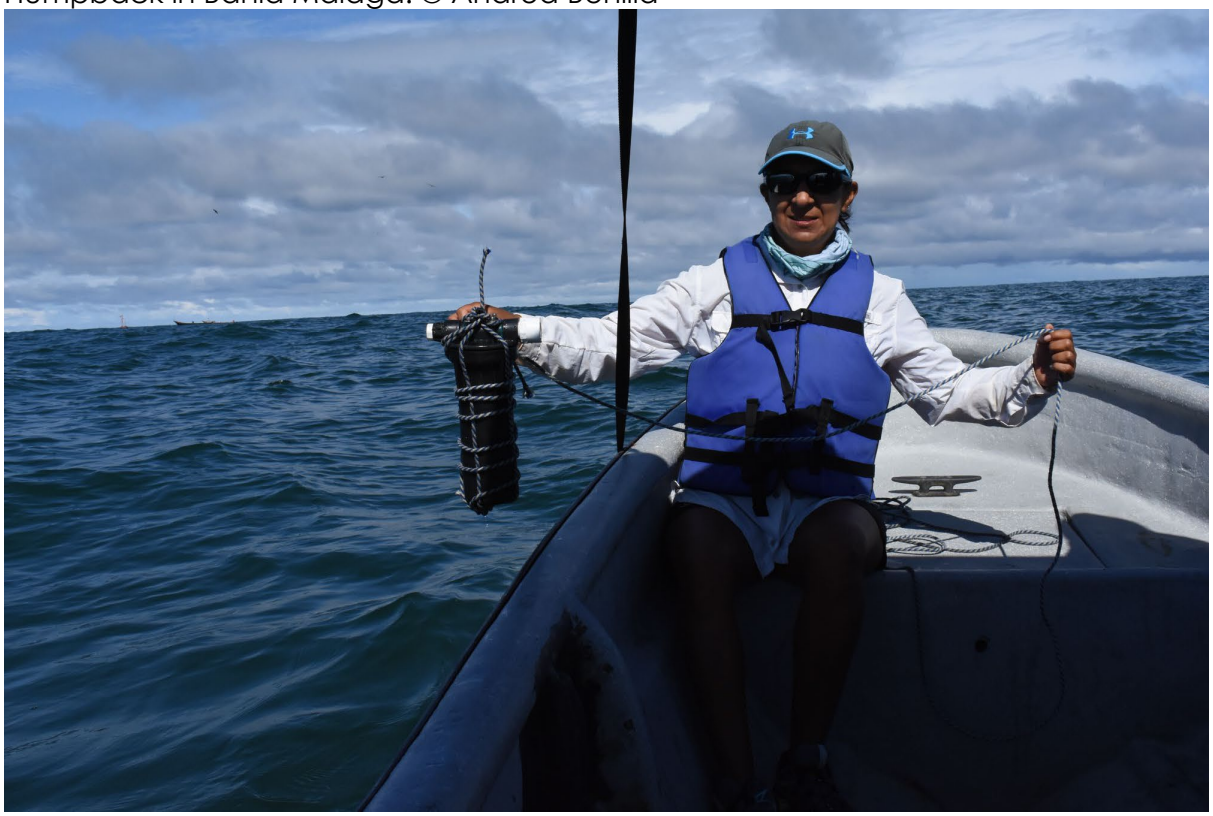
- Antarctic Station: **Nilton Sanchez, Edwin Aguilar†, Washington Valencia, Sergio Pico, Sadid Latandred and, Jimmy Fajardo.**

13. Any other comments?

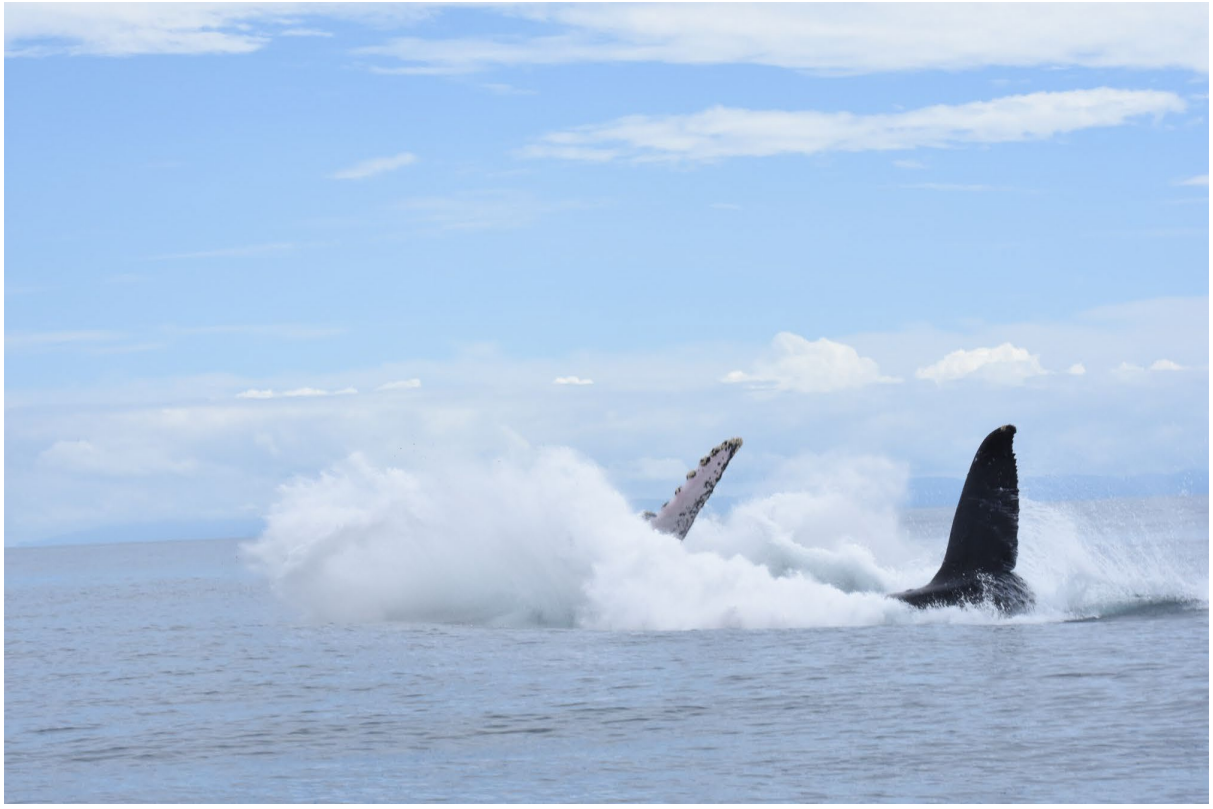
I'm very thankful for the patient that The Rufford foundation had with me despite all the inconveniences and logistic challenges that occurred during the development of this project. The Rufford Foundation has contributed significantly to the development of research in Colombia. And it has also contributed to the building of skills and human capabilities of young students and early career researchers in the field of marine mammals' studies.



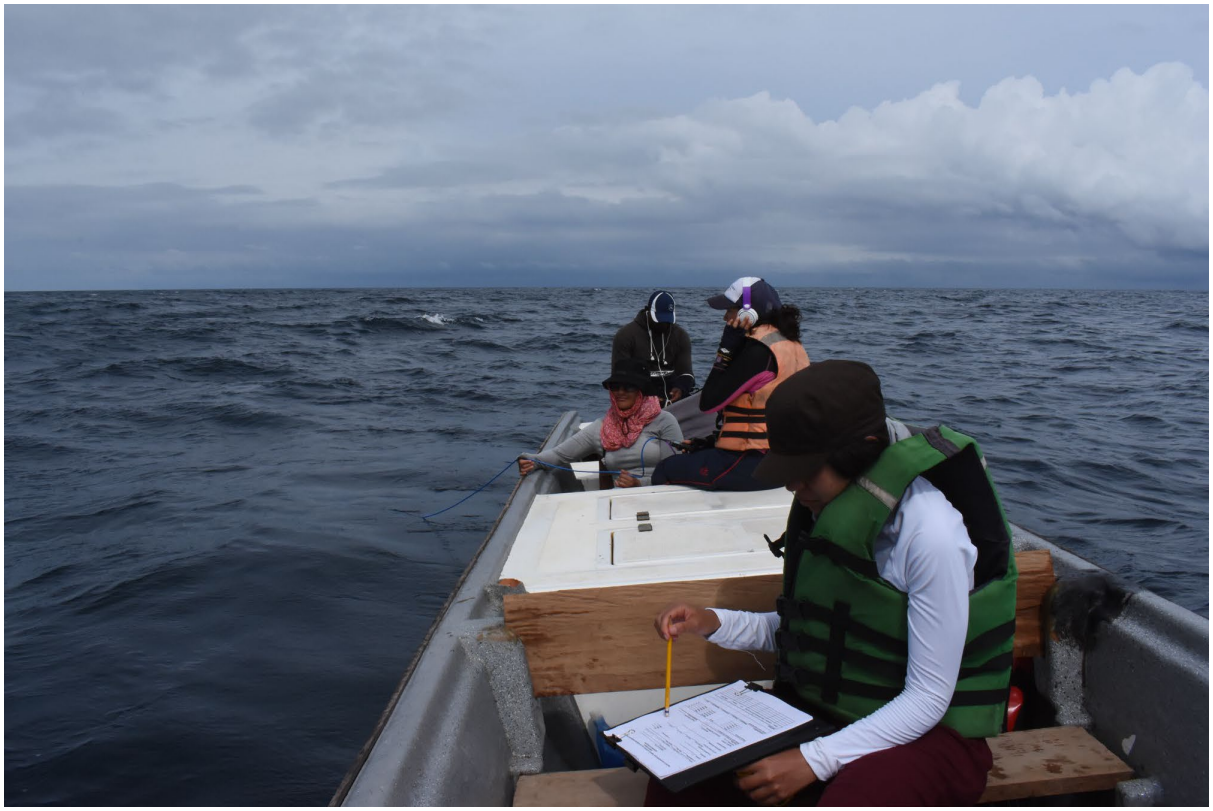
Humpback in Bahia Malaga. © Andrea Bonilla



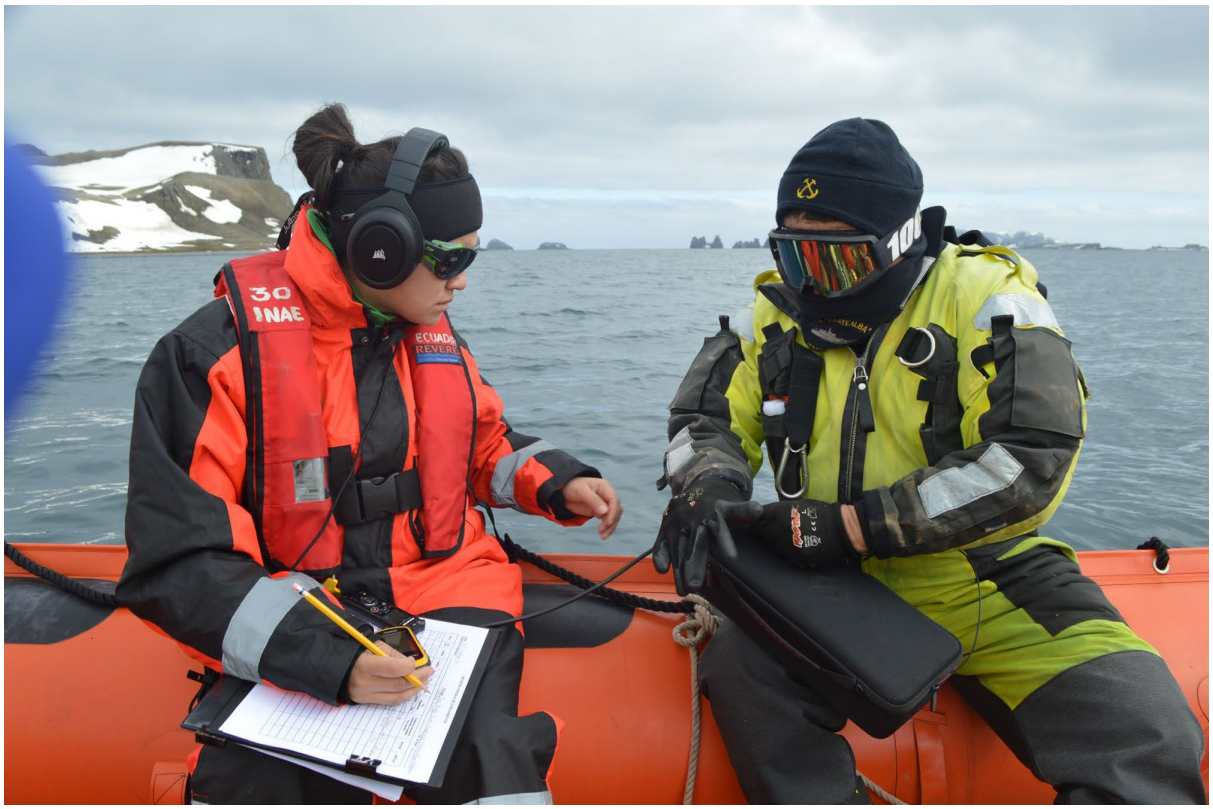
Lorena Viloria holding a stationary recorder. © Andrea Bonilla



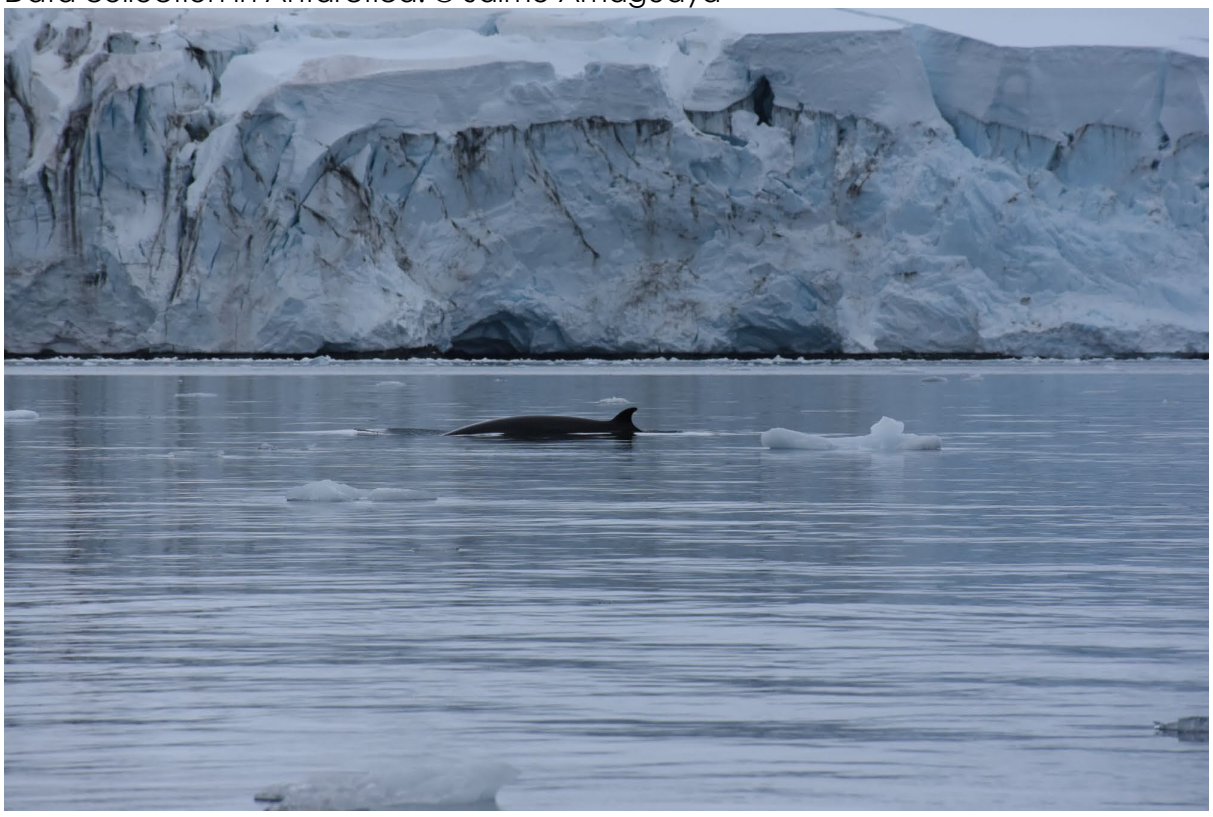
Whale breach. © Lorena Viloria



Team gathering data in Bahia Solano. © Lorena Viloria



Data collection in Antarctica. © Jaime Amaguaya



Minke whale in Antarctica. © Andrea Bonilla