

PROGRESS REPORT

MARINE NAVIGATION AND LOCAL KNOWLEDGE WINTER 2021-2022

Objective: To identify vessel navigation routes in the Bay of Banderas. Gather local knowledge from captains and other vessel crew members regarding the various species of marine mammals in the region. Lastly, to identify the marine activities conducted within the bay.

Methods: A survey was designed and divided into sections to gather information about the social demographics of the interviewed individuals, characteristics of their vessels, and the activities they engage in within the bay. Each interviewee was asked to mark on a map the locations where they conduct their marine activities and their regular navigation routes. Furthermore, they were requested to identify, from an illustrated list, the marine mammals they most frequently observe in the bay. Lastly, they were inquired about the benefits that cetaceans bring to the community, their perceived threats to these species, and their proposals for minimizing or mitigating the mentioned threats.

The surveys were conducted during the winter of 2021-2022, between 7 AM and 10 AM, targeting boat captains from seven embarkation points within the Bay of Banderas: Sayulita, Punta de Mita, La Cruz de Huanacastle, Nuevo Vallarta, Puerto Vallarta (Marina Vallarta, Los Peines, and Muelle Los Muertos), Mismaloya, and Boca de Tomatlán.

Results: A total of 192 surveys were obtained from operators and crew members of 915 vessels. In some cases, the interviews were conducted with the president of a fishing or tourism cooperative or with the entrepreneur who owns multiple vessels. The community of Puerto Vallarta was where the majority of the surveys were conducted. The primary marine activities carried out in the bay include tourism, commercial fishing, recreational sport fishing, and transportation. Navigation in the bay predominantly occurs from Puerto Vallarta to destinations such as the Marietas Islands, Yelapa, Los Arcos, and Boca de Tomatlán. From La Cruz de Huanacastle, vessels navigate to fishing sites in the north and beyond the bay. Punta de Mita serves as a departure point for trips to the Marietas Islands National Park, while in the southern region of the bay, navigation primarily follows the coastal strip, with vessels operating as public transportation.

The interviewees identified humpback whales, orcas, and bottlenose dolphins as the most common species. Additionally, they mentioned that the benefits derived from these species are economic, social, and ecological in nature. They also highlighted that various forms of pollution are among the primary threats to these species.

These results were made possible thanks to the professional internship of biology student Elsa Nicol Pérez Meza, who supported the survey work and conducted preliminary data analysis as part of her internship. We express our gratitude for the financial support provided by the Rufford Foundation for carrying out this activity and to Dr. Rosa María Chávez Dagostino for her guidance in survey development. We also extend our thanks to the boat captains and crew members who participated in the surveys.

The results presented in this report pertain to the activities of Objective 1 and will be used to conduct the analyses and make recommendations for Objectives 2, 3, 4, and 5 of the project.

Aplicación de Encuestas a prestadores de servicios

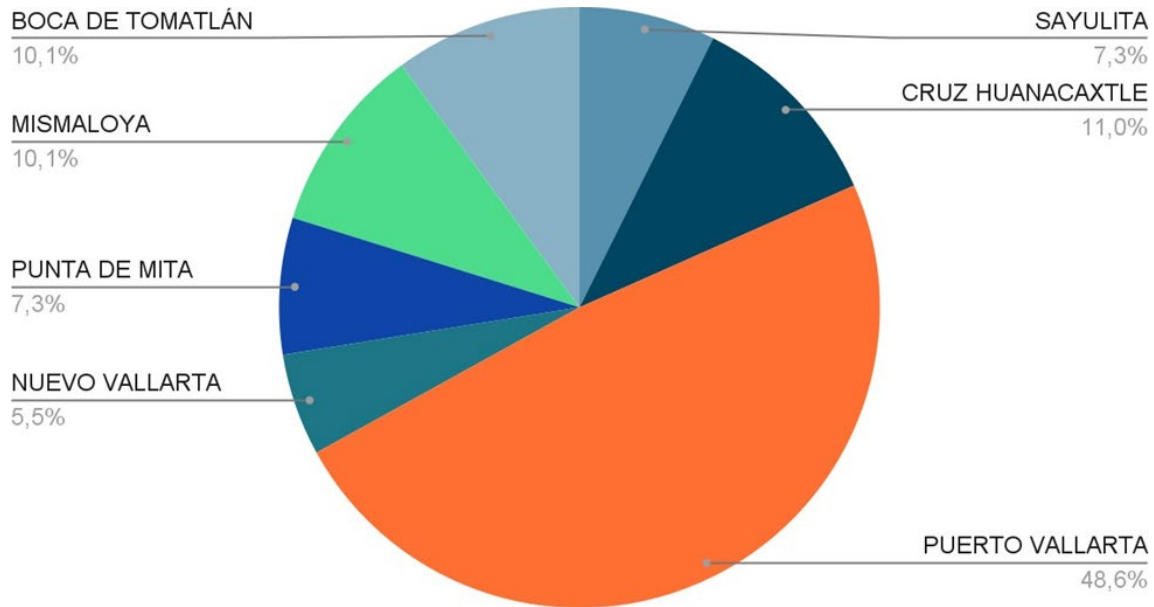
Acompañamos a nuestra practicante Nicol del CUC, a relizar encuestas a capitanes de embarcaciones para conocer sus principales actividades en la bahía y nos ayuden a identificar que especies de mamíferos marinos son avistadas con mayor frecuencias



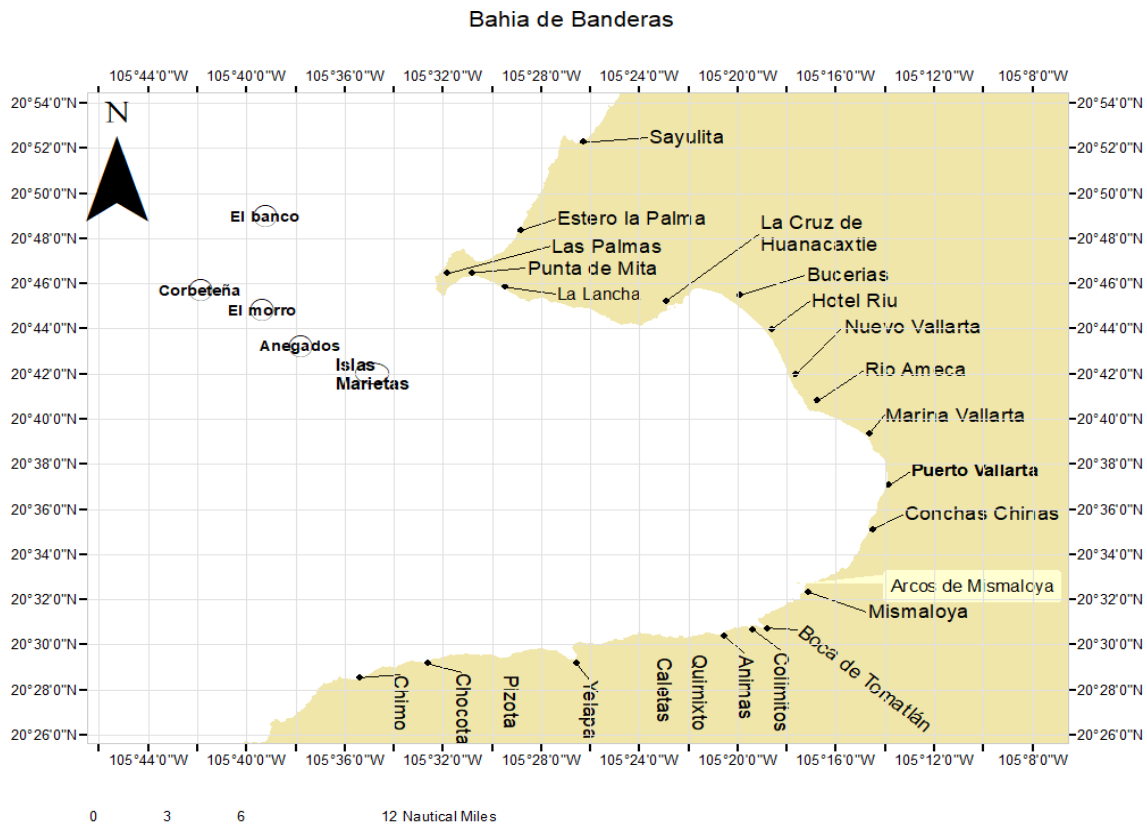
¡Mantén el mundo vivo!



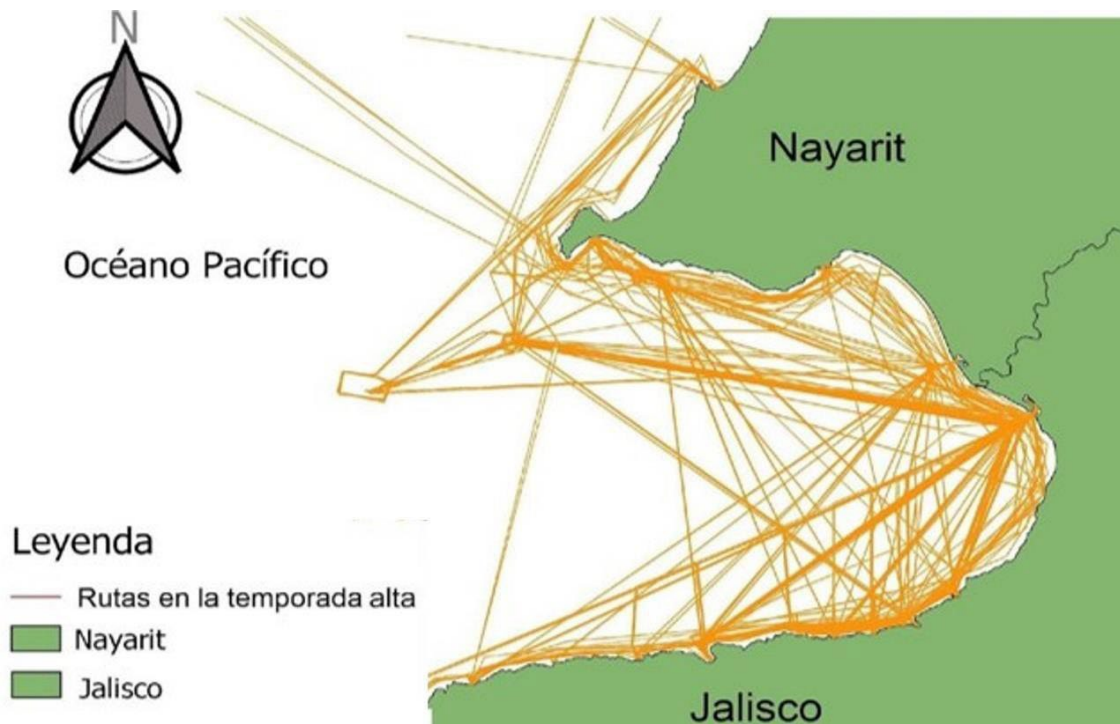
Conducting surveys in Banderas Bay communities among fishermen and tourism service providers.



Proportion of communities surveyed. The community of Puerto Vallarta is the largest and has 4 different embarkation points, so more people were surveyed.



Map given to respondents to plot their usual navigation routes.



Fishermen and tourist service providers follow the shipping routes. Map design by student Nicol.

FIRST MARINE SAMPLING SEASON: 2021-2022

Thanks to the support of The Rufford Foundation and the co-funding obtained from the Alas de Águila Foundation, the first field sampling season of the project was successfully concluded. Due to the co-funding amount and the receipt of The Rufford Foundation's budget (in late February), it was decided to conduct only marine sampling during the winter of 2021-2022 and address the remaining objectives in the subsequent season (2022-2023).

Objective: Conduct 24 field outings, 4 per month, between November 2021 and April 2022, utilizing the distance sampling method. Perform 186 CTD casts.

Activities and Variables: During the marine mammal observation surveys, the following activities were conducted and the following variables were recorded:

- Counting and identification of observed marine mammals, including species, number of individuals, initial behavior, and geographical position.
- Utilization of a CTD device to measure the electrical conductivity of seawater, its temperature, and depth.
- Tallying of observed vessels navigating in the bay.
- Documentation of oceanographic and climatic variables such as sea state, visibility, cloud cover, wave size, and more.

Results: The projected 24 outings were carried out, with an average of 9 hours of

navigation per day. Oceanographic conditions were not always ideal for data collection. A total of 2,751 individuals were observed in 366 sightings. Eight different species from four families were identified: Balaenopteridae (*Balaenoptera edini* and *Megaptera noaeangliae*), Delphinidae (*Tursiops truncatus*, *Stenella attenuata*, *Steno bredanensis*, and *Pseudorca crassidens*), Kogiidae (*Kogia sima*), and Ziphiidae (*Mesoplodon peruvianus*).

Most species from the Delphinidae family and *M. novaeangliae* had a distribution throughout the entire bay, while the Kogiidae and Ziphiidae families were restricted to the south and southwest of the bay, respectively. Cetacean groups with calves were observed 47 times within the Delphinidae, Balaenopteridae, and Kogiidae families. With the exception of the Ziphiidae family, all families were observed feeding in the region. A total of 180 CTD casts were conducted. Surface temperatures during the winter fluctuated between 19 and 29 °C, while at a depth of 80 meters, temperatures ranged from 13 to 18 °C. Throughout the samplings, 744 vessels were counted navigating in the bay.

The samplings were conducted under La Niña oceanographic conditions, characterized by significantly lower-than-normal water temperatures both in the water column and at the surface. Additionally, a widespread red tide was recorded in the bay from January to April, accompanied by a significant fish mortality event.

Photographs of the tail fluke of the *M. novaeangliae* species were shared on the Happy Whale platform, which is an international database for researchers and citizen science. This effort was made possible with the assistance of a zoology and biology student from the University of San Diego, California, USA.

Acknowledgments and participation: In addition to the funding provided by the Rufford Foundation, external support from the community was secured to cover the final field outings. We received assistance from the National Technological Institute of Mexico, Bahía de Banderas Campus, and the Coastal University Center of the University of Guadalajara. Two tourist service cooperatives from the Punta de Mita community, along with seven boat captains, and 19 student volunteers from two local universities, contributed their valuable support. Furthermore, we are grateful to two foreign volunteers, one from Canada and the other from the United States of America, with the latter participating in an exchange program for her professional internship.

The results presented in this progress report pertain to Objective 1 and will serve as a complementary resource for the remaining objectives of the project.



Cetacean search in Banderas Bay. Project staff observers Roberto, Daniel. Project volunteer observers Ángel and Eduardo. Iyari Espinoza GRIMMA/UdG.



Taking data from the cetaceans and vessels observed. Project volunteer observers Angel, Delia and Kelsy. © Iyari Espinoza GRIMMA/UdG.



Group of bottlenose dolphins socialising. ©Daniel Aguirre. GRIMMA.



Marine sampling. On the left, the CTD is retrieved; on the right, a garbage bag is lifted. Iyari Espinoza. GRIMMA/UdG.



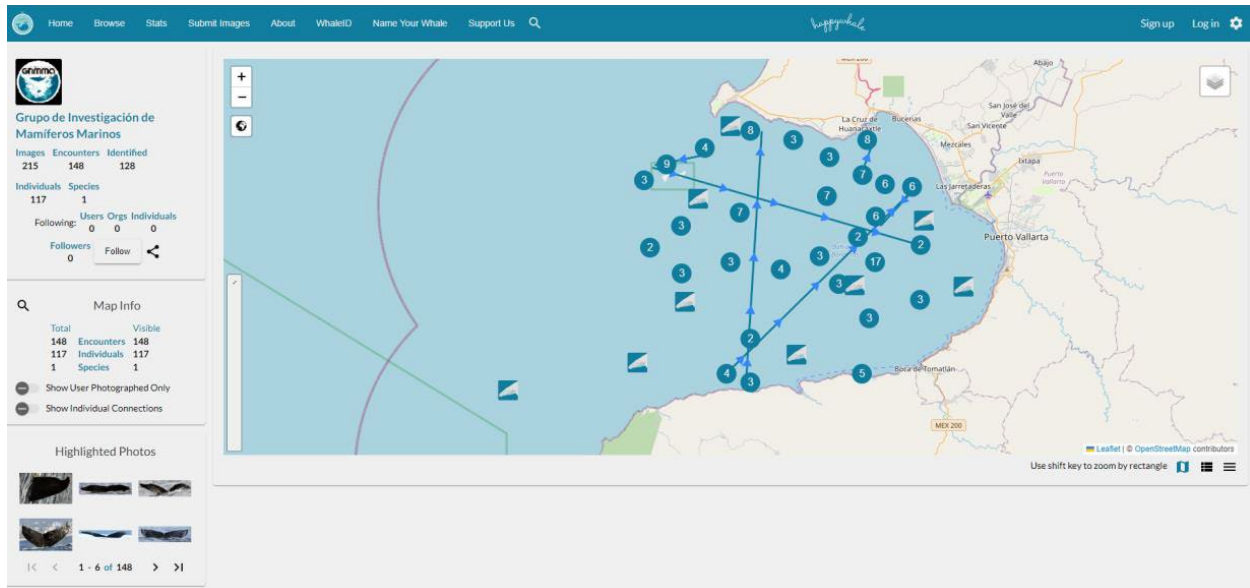
Pair of humpback whales. ©Guylaine Marchand, Canadian volunteer.



Our US volunteer Kelsy taking pictures to photo-identify whales. © Iyari Espinoza. GRIMMA/UdG.



Rough-toothed dolphin (*Steno bredanensis*). © Daniel Aguirre. GRIMMA.



Photographs of humpback whale flukes uploaded to the Happy Whale Online Platform.

SECOND WINTER SEASON OF MARINE SAMPLING: 2022-2023

Objective: To conduct 24 field excursions, 4 per month, spanning from November 2022 to April 2023, employing the distance sampling method. To procure a minimum of 186 recordings of marine sound.

Activities and Sampled Variables: During the survey outings, the following activities were conducted, and variables were recorded:

- Marine Mammal Observations: Marine mammals observed were counted and identified, including species, number of individuals, initial behavior, geographical position, and more.
- Hydrophone Recordings: At intervals of 7.4 kilometers, 3 to 5-minute recordings were made using the hydrophone. The objectives were to capture the following variables: acoustic signals from marine mammals and vessel noise.
- Vessel Counting: Throughout the entire marine journey, the number of vessels navigating in the bay was tallied.
- Oceanographic and Climatic Variables: Various oceanographic and climatic variables were noted, including sea state, visibility, cloud cover, wave size, and more.

Results: All planned outings were successfully conducted. On average, 9 hours of navigation were completed each day. Occasionally, oceanographic conditions hindered the collection of certain variables. A total of 3,283 individuals were observed in 342 sightings of marine mammals. Seven different species were identified, with two sightings only reaching the family level of identification due to organism behavior and/or weather conditions. Three families were observed this season: Balaenopteridae (1 species), Delphinidae (5 species + 1 unidentified), and Kogiidae (1 species + 1 unidentified). Species from the Delphinidae and Balaenopteridae families were

observed throughout the entire bay, while the distribution of the Kogiidae family was limited to the southern part of the bay. In 58 sightings, the presence of calves was detected among the observed groups of the following species: *Orcinus orca*, *Tursiops truncatus*, *Pseudorca crassidens*, *Stenella attenuata*, and *Megaptera novaeangliae*.

Throughout the sampling period, 859 vessels were observed traversing the bay over the course of 6 months. A total of 166 recordings of oceanic noise were conducted at a depth of 30 meters. In the hydrophone recordings, the presence of marine mammals was identified on 103 occasions, while the presence of vessels (whether visible or not) was noted 95 times. Notably, in 26 instances, no discernible sound was ostensibly detected.

Similar to the previous season, sampling was conducted under the oceanographic phenomenon La Niña, which means cold water column conditions were maintained. However, in contrast to the previous season, there were fewer algal blooms (red tides).

Acknowledgments and Participation: The funding for field trips was obtained through the generous support of The Rufford Foundation, with the final month of external funding thanks to the assistance of local communities. Additionally, we received support from the National Technological Institute of Mexico, Bahía de Banderas Cam us, and the University of Guadalajara's Coastal University Center. Two tourist service cooperatives from the Punta de Mita community, along with two tourist service companies from La Cruz de Huanacaxtle, also contributed their support.

Furthermore, we are grateful to 13 boat captains and 27 student volunteers from two local universities, as well as two foreign volunteers, one from Canada and the other from Germany. The latter participated in an exchange program to carry out her professional internship.

Thanks to Katherine Comer Santos and The Science Exchange for bringing foreign volunteers to our project for their internships.

Before and during the sampling, training sessions were conducted for the boat captains and tourism service providers to enhance their practices in navigating cautiously in the presence of cetaceans. Additionally, volunteers were trained in species identification and data collection of the obtained variables.

The results of this report pertain to Objective 1 and will serve as a complement to the remaining objectives of the project.



Excursion from the port of La Cruz de Huanacaxtle. Project staff, Roberto and Iyari; Alpha Project volunteers, Arturo and Angel; Captain Ricardo. Angel, project volunteer.



Taking pictures and data of a pod of whales we observed. Volunteer, Salma, project staff, Iyari and Roberto. ©GRIMMA.



Some of the members of a group of killer whales with several calves observed in Banderas Bay. ©Guylaine Marchand, Canadian volunteer.



Grupo de delfines moteados observados en la bahía. ©Guylaine Marchand, Canadian volunteer.



Humpback whale fluke photograph. ©Guylaine Marchand, Canadian volunteer.



One of our volunteers, Rocio, collecting floating rubbish in the bay. © Iyari Espinoza GRIMMA/UdG.

SENSITIZATION OF BOAT CAPTAINS

Objective: To raise awareness among boat captains about the importance of the cetaceans in the bay and habitat conservation.

GRIMMA, in collaboration with the Ministry of Environment and Natural Resources (SEMARNAT), organized 5 training workshops aimed at the tourist communities of the Bay of Banderas. In addition to the project members from GRIMMA, efforts were made to involve local environmental authorities and civil associations in delivering the following topics:

1. SEMARNAT (Nayarit and Jalisco): Management of non-extractive use for tourism and recreational purposes (Whale watching).

2. Federal Attorney for Environmental Protection (PROFEPA): Protocol for Marine Mammal Strandings Response.
3. PROFEPA: Regulations for whale watching.
4. GRIMMA: Marine Mammals of the Bay of Banderas and Humpback Whale Observation Techniques.
5. GRIMMA: Biology of the Humpback Whale.
6. GRIMMA: Whale Watching Tourism in the Bay of Banderas: Expectations and Realities.
7. Ecology and Conservation of Whales (ECOBAC): Issues in Paradise: Collisions and Entanglements.
8. GRIMMA: Whales to the Sea, Trash to the Shore: Marine Debris in the Bay of Banderas.

All the workshops conducted by GRIMMA as part of the training were integral components of the Rufford project's outcomes.

Each workshop had a duration of 7 hours and was attended by 511 boat captains and guides from the communities of Boca de Camichín, San Blas, Guayabitos, La Peñita de Jaltema, Sayulita, Punta de Mita, La Cruz de Huanacaxtle, Bucerías, and Nuevo Vallarta in the state of Nayarit, as well as Puerto Vallarta, Mismaloya, Boca de Tomatlán, Quimixto, Yelapa, and Bahía de Tenacatita in the state of Jalisco. During the workshops, 70 nets were distributed for collecting floating marine debris as part of GRIMMA's emergent campaign, "Whales to the Sea, Trash to the Shore," which originated from the observation of the number of floating debris during the marine samplings conducted in the previous 2021-2022 season. At the conclusion of the workshops, an evaluation instrument was administered to the attendees, resulting in an 87% satisfaction rate.

This activity corresponds to Objective 5 of the project and was made possible thanks to the financial support from local communities, who obtained funding from the National Commission of Natural Protected Areas (CONANP). This funding not only covered the workshop but also allowed for the purchase of the nets. This became necessary because, during the planning of the sensitization activity, it was initially intended to be incorporated within the annual training workshop provided by SEMARNAT to tourism service providers. However, due to budget constraints within SEMARNAT, and in the wake of the COVID pandemic, the agency was unable to organize these workshops for two consecutive years. As a result, the decision was made to seek support from the local community and independently organize the workshops. Thanks to the National Technological Institute of Mexico, Bahía de Banderas Campus, in La Cruz de Huanacaxtle, CECATI, and the Ministry of Agriculture and Rural Development (SADER) for lending their auditoriums to conduct the workshops at the locations of La Cruz de Huanacaxtle, Puerto Vallarta, and Tepic.

In the following links you will find the publications of the awareness activities and the materials for the dissemination of the regulations for whale watching in Mexico (NOM-131-SEMARNAT-2010):

https://m.facebook.com/story.php?story_fbid=pfbid02NLa85txt9CE52ZARXxWmDDkUBXyYx41NyKW472AnPYTZcrEEamxW32B3dbUGAE7FI&id=293688947333976&sfnsn=scwspwa&mibextid=RUbZ1f

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https://m.facebook.com/story.php?story_fbid=pfbid0344o7sz7jozb1mrXc1b6astfrzXPoC2p8g46E9fagYNmFHHMftXqgZmxWvqNZ5boGI&id=293688947333976&sfnsn=scwspwa&mibextid=RUbZ1f

https://m.facebook.com/story.php?story_fbid=pfbid0bqnj8y5SXMCBQ5hsDPjbsEkd5NH67TV5RPRd3Qdb2z5U1C4K6AGBB1CWbmbEQ9gl&id=293688947333976&sfnsn=scwspwa&mibextid=RUbZ1f

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https://m.facebook.com/story.php?story_fbid=pfbid02WLw7CsjhQeh9ypT9A69XWbw9S w7e2GK1jEwzoJyKCA9tRaKx9YFe2u182aVoAQAUl&id=293688947333976&sfnsn=scwspwa&mibextid=RUbZ1f

https://m.facebook.com/story.php?story_fbid=pfbid0GyynHy378eqj2oXCRbrtZYwdJx6xPtTn4TH94TaTuQ2Ri8bvFJm6utz4QyTm5p1DI&id=293688947333976&sfnsn=scwspwa&mibextid=RUbZ1f

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Below photographs of the training workshops in Bahía de Banderas:



Training workshop in Tepic, Nayarit, Mexico. Speaker: Iyari Espinoza. GRIMMA/UdG. © Lesli Solís PROFEPA.



Training workshop in Puerto Vallarta, Jalisco, Mexico. Speaker: Lesli Solís, PROFEPA. © Daniel Aguirre. GRIMMA.



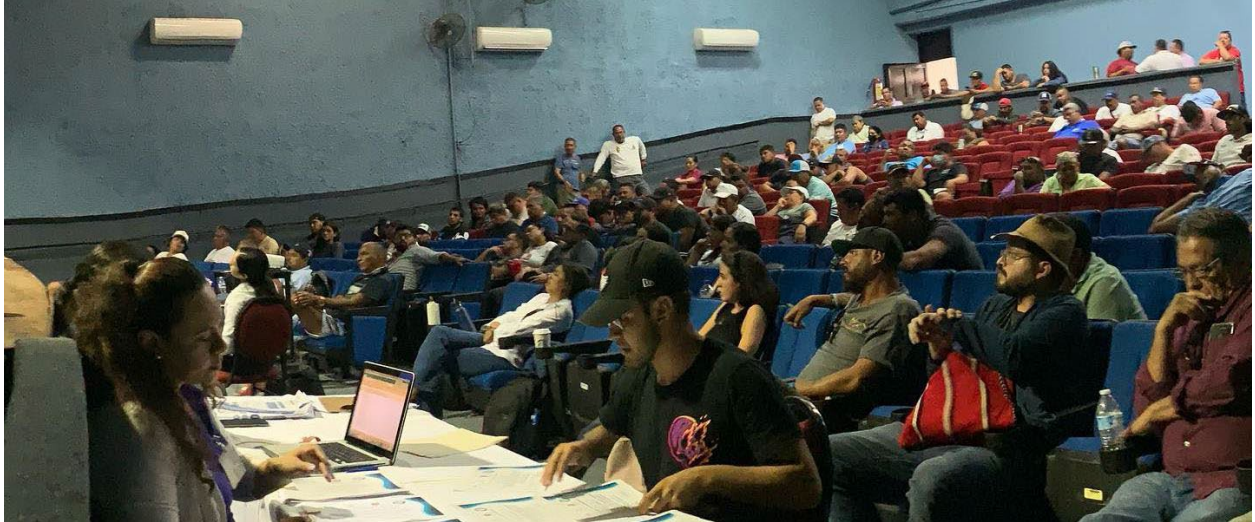
Training workshop in La Cruz de Huanacaxtle, Nayarit, Mexico. Speaker: Iyari Espinoza, GRIMMA/UdG. © Lesli Solis PROFEPA.

LAS BALLENAS AL MAR, LA BASURA AL COSTAL



The Rufford Foundation
www.rufford.org @ruffordgrants

Distribution of nets for collecting floating rubbish as part of the "Whales to the Sea, Trash to the Bag" campaign". © Iyari Espinoza GRIMMA/UdG.



Registration for the training workshop in Puerto Vallarta, Jalisco, Mexico. © GRIMMA.



Inauguration of the training workshop in La Cruz de Huanacastle, Nayarit, Mexico. © Iyari Espinoza.



Attendance at the training workshop in La Cruz de Huanacastle, Nayarit, Mexico. © Iyari Espinoza. GRIMMA/UdG.