CBMC
CENTRO PARA LA BIODIVERSIDAD MARINA Y LA CONSERVACIÓN, A.C.

dataMares
www.datamares.org

MONITORING PROGRAM FOR MARINE MAMMAL SIGHTINGS IN CABO SAN LUCAS, BAJA CALIFORNIA SUR.

HUMPBACK WHALE

Megaptera novaeangliae

REPORT • SEPTEMBER 2021

PREPARED BY:
Juan José Cota Nieto
Dayana Mendez
Rosa Hirales
Ismael Mascareñas Osorio
Centro para la Biodiversidad Marina y la Conservación

COLABORADORA:
Catalina López-Sagástegui
Institute of the Americas

CONTACT INFORMATION
Juan José Cota Nieto
Centro para la Biodiversidad Marina y la Conservación A.C.
Correo electrónico: **juan.jose@gocmarineprogram.org**

Centro para la Biodiversidad Marina y la Conservación A.C.
Calle Del Pirata 420, Fraccionamiento Benito Juárez
La Paz B.C.S., México. C.P. 23090.
Teléfono. 612 146 17 65

SUGGESTED CITATION:
Mascareñas-Osorio, I, Mendez-Espinoza, D., Hirales-Cota, J.J., Cota-Nieto y López-Sagástegui, C. (2022). Monitoring Program for Marine Mammals in Cabo San Lucas, Baja California Sur – Humpback whale (*Megaptera novaeangliae*). Technical Report. Centro para la Biodiversidad Marina y la Conservación A.C. – Gulf of California Marine Program.

The information generated is available on dataMares or by contacting Catalina López-Sagástegui (catalina@gocmarineprogram.org).

INSTITUTE OF THE AMERICAS | GULF OF CALIFORNIA MARINE PROGRAM

Monitoring of tourism activities is supported through the Gulf of California Marine Program at the Institute of the Americas.

1. INTRODUCTION

The Bay of Cabo San Lucas (hereafter CSL) is a site where three different currents converge: the California Current (masses of cold, low-salinity water), the Gulf Stream (masses of warm, high-salinity water), and the Costa Rica Current (masses of warm water with intermediate salinity)[1]. It has a reduced internal continental shelf with a gentle slope that quickly becomes very deep towards the submarine canyon; the shallow part at the canyon has a depth of 20 meters, while the deepest part can reach depths of 2,000 meters. These oceanographic and bathymetric conditions attract numerous species that have become the foundation of a tourist economy, including sharks, orcas, mantas, turtles, reef fish, marlin, dorado, as well as migratory species such as gray, blue and humpback whales.

In this report, we describe the tourism activity focused on humpback whale watching in the CSL region, both inside and outside the San Lucas Flora and Fauna Protection Area. Based on the Collaborative Science Program implemented by the Centro para la Biodiversidad Marina y la Conservación (CBMC) in other regions, we established a pilot program in collaboration with Cirjaro Tours to explore the possibility of implementing a monitoring program for marine tourist activities in CSL, including humpback whale watching. The goal is to contribute to conservation and resource management efforts with information that helps preserve social and ecosystem integrity.

1.1 THE SAN LUCAS FLORA AND FAUNA PROTECTION AREA

Los Cabos is located on the western side of the mouth of the Gulf of California. These waters maintain characteristics like those of the equatorial Pacific, with slight modifications on the surface due to extensive evaporation and the mixing effect with water from the south of the California Current. The influence of the latter is limited to the Cabo San Lucas region[2] (Figure 1).

Cabo San Lucas can be divided into two distinct zones based on bathymetry and habitat type. The San Lucas Inlet has a small, steeply sloping continental shelf that connects to a submarine canyon over 2,000 meters deep. The predominant habitats in the inlet are sandy bottoms and cliffs or walls covered with sea fans. The Bay of San Lucas, which has a wider continental shelf, hosts rocky reefs dominated by stony corals (Pocillopora). The Bay was declared a protected area on November 29, 1973; however, on June 7, 2000, it was granted the category of the Flora and Fauna Protection Area[3].

[1] Álvarez-Borrego, S. 1983. Gulf of California. In: Estuaries and enclosed seas (B.H. Ketchum, ed.). Elsevier. Amsterdam. Pp. 427-449.

[2] Roden, Gunnar I. 1958. Oceanographic and meteorological aspects of the Gulf of California. Pacific Science. Vol. XII, 21-45 pp.

[3] https://simec.conanp.gob.mx/ficha.php?anp=113&reg=1

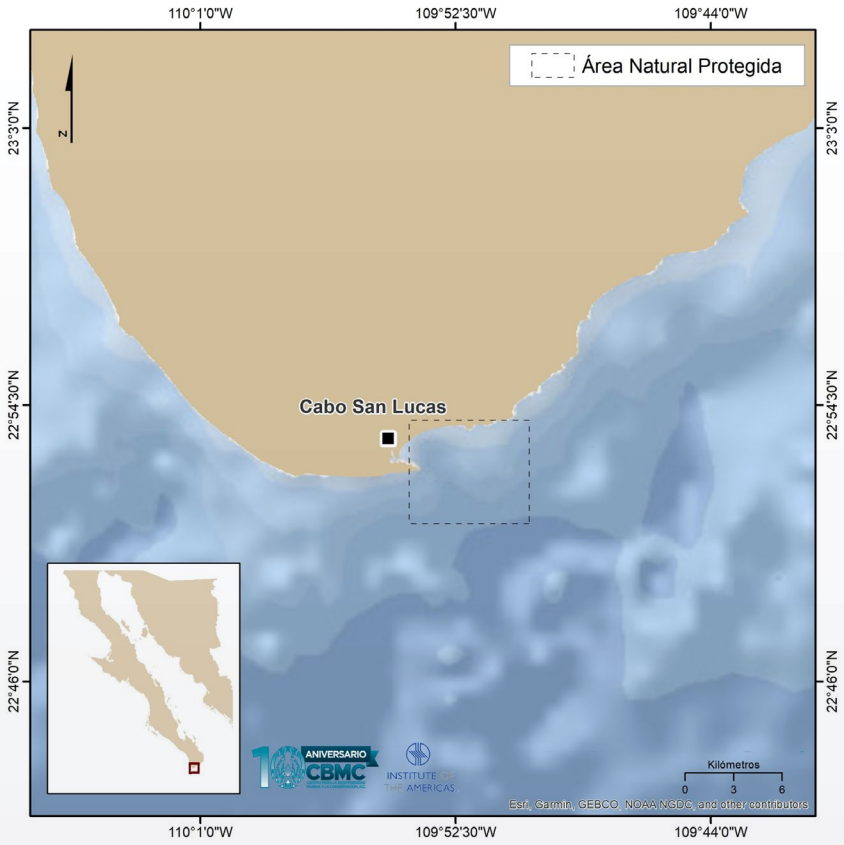

Figure 1. Location of Cabo San Lucas Bay and the boundary of the San Lucas Flora and Fauna Protection Area.

2. DIVERSITY OF ACTIVITIES IN THE BAY OF CABO SAN LUCAS

The Baja California Peninsula accounts for nearly 50% of the total national fisheries production[4]. Unlike other highly productive fishing areas, in CSL, the most significant activities are those related to tourism. Due to the increase in economic resources generated by the tourism industry, especially in coastal areas, which, thanks to the variety of ecosystems, landscapes and great biodiversity, ecotourism has gained interest in nearby communities[5]. Although commercial fishing is not predominant, it focuses on species like sardines or mackerel, which are in demand as bait for sport fishing. Sport fishing, diving and tours for the observation of charismatic fauna such as sharks, mantas, whales and orcas constitute the main tourism activities in CSL.

Despite the importance of whale watching and other charismatic species for the region's economy, few studies have focused on analyzing them from an economic perspective while documenting their spatial and temporal dynamics. For this reason, this document presents a preliminary effort to determine the economic contribution and identify the spatiotemporal dynamics related to whale watching activities focusing on humpback whales (*Megaptera novaeangliae*) in Cabo San Lucas, Baja California Sur.

[4] Cisneros-Mata, M. A. 2010. The importance of fisheries in the Gulf of California and ecosystem-based sustainable co-management for conservation. The Gulf of California, Biodiversity and Conservation. Arizona-Sonora Desert Museum Studies in Natural History. The University of Arizona, Tucson, Arizona, pp. 119-134.

[5] Ibáñez, R.M. 2015. Medición de la sustentabilidad turística en un Área Natural Protegida del Noroeste de México. Área Natural Protegida Scripta, 1(1), 9-34.

3. GENERAL OBJECTIVE

Expand the Collaborative Science Program to include whale watching activities focused on humpback whales (*Megaptera novaeangliae*) in Cabo San Lucas, Baja California Sur.

3.1 SPECIFIC OBJECTIVES

• Establish a collaborative relationship with tourism service providers in CSL to implement a monitoring program for activities related to the observation of marine mammals.

• Study the spatial and temporal dynamics of activities focusing on marine mammals in Cabo San Lucas and estimate: (a) average distance per trip; (b) average duration per trip; (c) average number of tourists per trip; (d) average gasoline consumption per trip; (e) average number of sightings per trip; and (f) average cost of the trip to the tourist.

• Contribute economic and spatial information to enhance conservation and management measures for activities related to marine mammal tourism in CSL.

4. METHODOLOGY IMPLEMENTED FOR DATA COLLECTION

In collaboration with tourist service providers, we generated two types of information: (1) geospatial data collected through GPS data loggers on each vessel; and (2) trip details through logbook records. All the information was analyzed collectively to provide a detailed description of the tourism dynamics in CSL. The information and research results can be visualized in a Geographic Information System (GIS) that will help develop management schemes endorsed and accepted by communities and authorities.

4.1 METHODOLOGY IMPLEMENTED FOR SPATIAL DATA ANALYSIS

A. Data Compilation

The spatial information collected consists of two main components: a) spatial information containing coordinates (latitude, longitude), speed, and duration of each fishing trip; and b) sighting information consisting of file name (alphanumeric code), number of observations, number of tourists, service charge (in pesos), gasoline consumption (in liters), number of adults observed, number of calves observed, start time of the trip, and end time of the trip.

B. Digitization of Observation Zones

With the experience gained from our fisheries monitoring program, we designed a technique to identify whale sighting zones using the speed of the boat and the maneuver it performs. According to interviews with service providers, sightings are characterized by using the engine in forward mode, and when they spot a whale, the engine is put in neutral.

We use the CanWay software which allows us to visualize the route on Google Maps and eliminate incomplete or erroneous data. With ArcGIS™ 10.4.1 software we calculate the distance covered in each trip and can associate the information of each sighting with its respective route through the file name. Sighting zones are identified when the vessel's speed range is between 0-6 km/hr (Figure 2). Once identified, we calculate the distance covered by the vessel and the duration of the sighting.

C. Spatial Analysis

Once the sighting zones were digitized, we were able to determine the total area where observations were recorded using the Directional Distribution tool. In ArcGIS, we created an ellipse around whale sighting sites located at the center of the points, specifying two standard deviations to cover a 95% confidence interval. We then created a polygon around the outer limits using the Aggregate Points tool, and finally we calculated the area of the polygon.

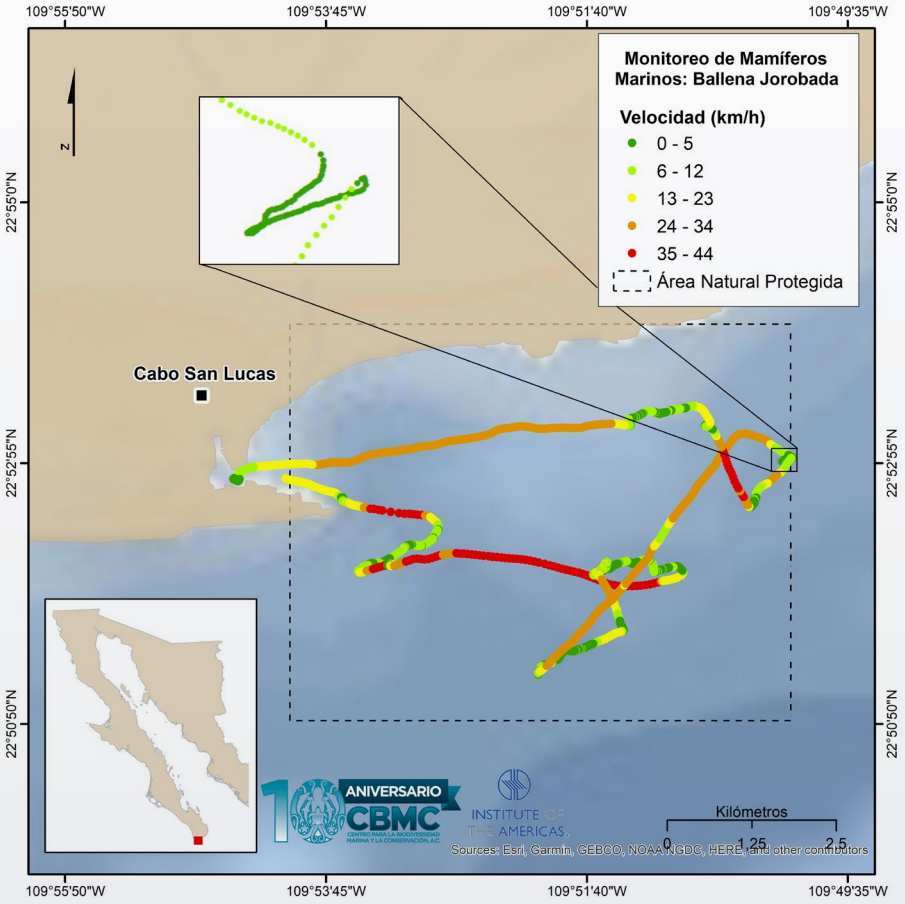

Figure 2. Example of GPS data logger recording during a whale watching trip. Boat speeds, represented by the different colors, and route pattern help the research team to identify the areas where sightings occurred. Source: Gulf of California Marine Program's Collaborative Science Program (2022).

5. RESULTS

In this report, we include information from Cabo San Lucas, B.C.S., covering data from a single humpback whale watching season involving two vessels from December 2021 through March 2022. We documented 57 whale watching trips, of which 54 have spatial information (Figure 3). The obtained data reveals that 223 tourists participated in this activity.

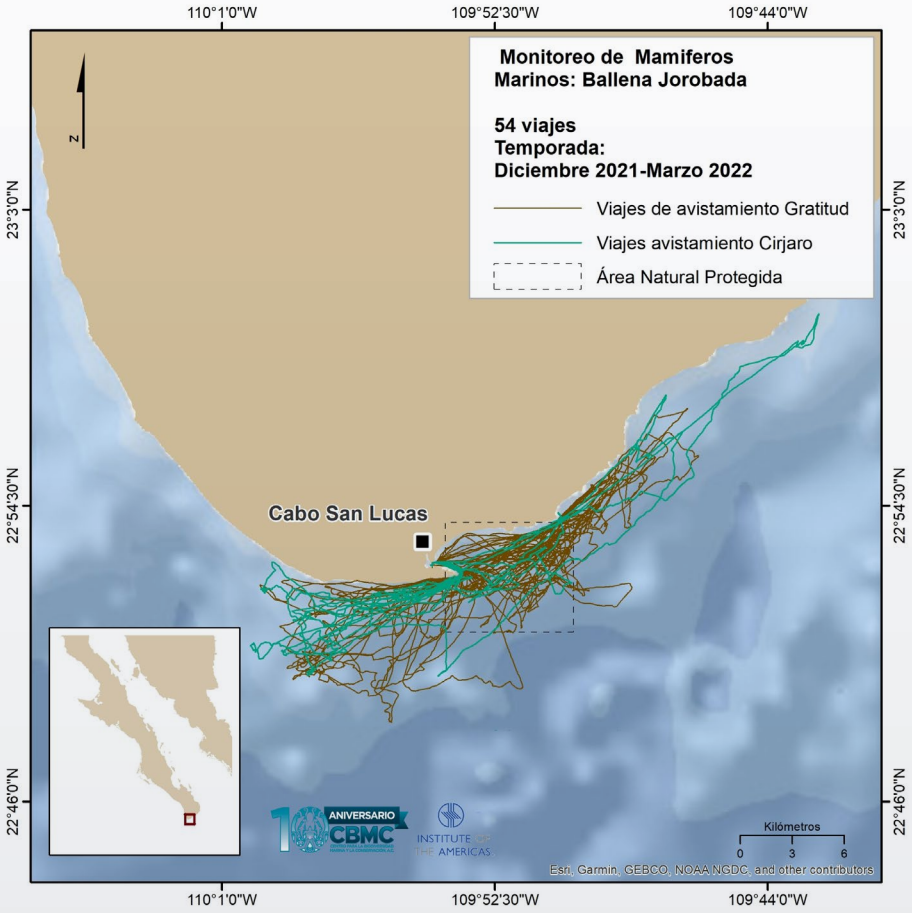

Figure 3: A total of 172 whale watching trips were monitored in Cabo San Lucas, Baja California Sur, from December 2021 through March 2022. Source: Gulf of California Marine Program's Collaborative Science Program (2022).

The trips for humpback whale watching departed from the San Lucas Inlet. For this dataset, we found that the trips lasted an average of 2.8 hours and covered an average distance of 26 km (Table I). Unfortunately, we could not determine the fuel expenses as they were not recorded in the logbooks of any of the trips.

Finally, we estimated the total sighting area (Figure 4) and the zones with the highest likelihood of humpback whale sightings in Cabo San Lucas. With the data obtained in this pilot study, we identified four zones as the most important for whale watching. Although the protected area is an important zone for whale watching, there are more distant areas that tend to concentrate individuals and could be used as additional sighting zones.

BOAT	Trips	Total tourists	Tourists per trip	Sightings per trip	Duration of trip (hrs)	Distance per trip	Cost per trip (pesos)
CIRJARO	12	15	3.75	2.64	3.4	31.3	$2,600
GRATITUD	42	208	4.84	3.09	2.6	28.7	
TOTAL	54	223	4	3	2.8	26.4	$2,600

Table I. Summary of data collected through tourism operators' logs of each whale watching trip in Cabo San Lucas, B.C.S. from December 2021 through March 2022. Source: Gulf of California Marine Program's Collaborative Science Program (2022).

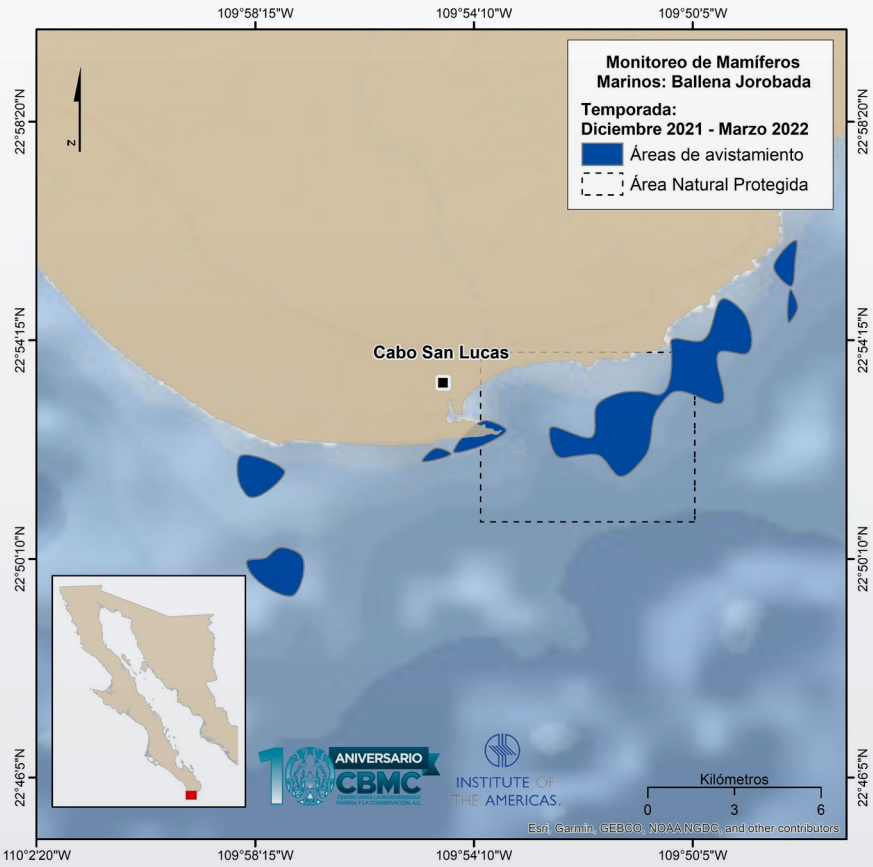

Figure 4: Areas with highest probability of finding humpback whales (shaded areas) based on the sightings recorded from 172 trips between December 2021 and March 2022. Source: Gulf of California Marine Program's Collaborative Science Program (2022).

6. CONCLUSIONS AND NEXT STEPS

Understanding the movement patterns of the tourism fleet and its relationship with natural resources, in this case, humpback whales, is of great importance. This will broaden our knowledge of the economic value of tourism activities focusing on marine mammals in the Cabo San Lucas. Additionally, this information is relevant for service providers to have precise data on time, distance, and earnings compared to other activities within the Bay, enabling them to make administrative decisions that ensure the growth and security of their businesses.

Detailed information on an economic activity will not only assist those involved in tourism but can contribute to the design and implementation of management and conservation measures than ensure long-term sustainability. Whale watching is an activity that needs regulation but requires information that is often challenging to generate. The Collaborative Science Program developed by CBMC can contribute to addressing this challenge. However, for this to be accomplished, the following is needed:

1. Increased participation from tourist service providers.
2. Access to precise information associated with whale watching.

All this information is valuable for future evaluations of fleet activities and even for the permit application process since different institutions are responsible for regulating these activities.

ACKNOWLEDGEMENTS

We extend our gratitude to the teams at Cirjaro Tours and Bluefish Tours for their willingness to participate in the pilot monitoring program in Cabo San Lucas. We appreciate the feedback provided during the working period which undoubtedly contributes to improving the collaborative science efforts we aim to implement.

CBMC
CENTRO PARA LA BIODIVERSIDAD MARINA Y LA CONSERVACIÓN, A.C.

dataMares
www.datamares.org

INSTITUTE OF THE AMERICAS

GULF OF CALIFORNIA MARINE PROGRAM