Laguna San Ignacio Ecosystem Science Program
A Project of the Ocean Foundation in Baja California Sur, Mexico

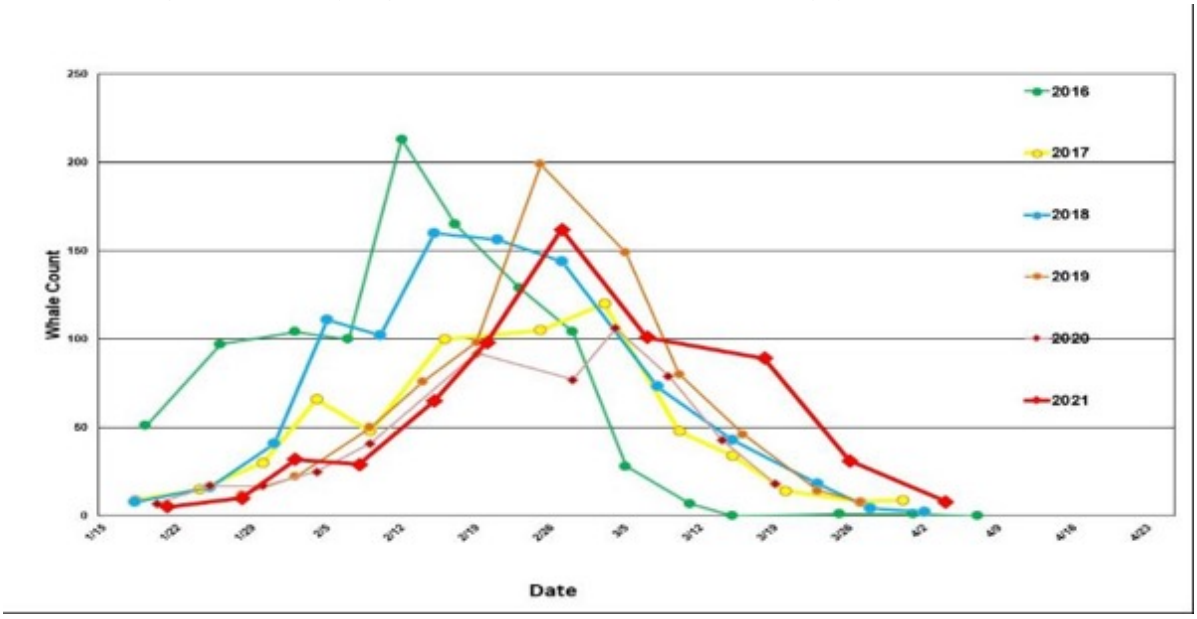
Winter 2021 Annual Research Report for Laguna San Ignacio and Bahía Magdalena, B.C.S., México

Winter 2021 Gray Whale Research During the COVID-19 Pandemic: Our field research teams arrived at Laguna San Ignacio and Bahía Magdalena in mid-January to begin preliminary surveys of the gray whales and to observe the general conditions in each area. This year all of our researchers came from the Autonomous University of Baja California Sur's (UABCS) Marine Mammal Program (PRIMMA) in La Paz, Baja California Sur, México. Our colleagues and collaborators from outside of México stayed home for the winter because of the risks of traveling during the COVID-19 pandemic. While in the field our researchers operated under specific protocols to protect their health and safety, and to minimize the risk of becoming infected with the COVID-19 virus, and to protect the safety of the local residents of Laguna San Ignacio and Bahía Magdalena. We are grateful for the assistance we received from our community friends.

This winter Dra. Lorena Viloria Gómora directed the Bahía Magdalena team which included Daniela Bernot Simon, Omar Castañeda García, Mario Marquéz Segovia, Lorena Citlalli Magallón Flores, Omar Flores Ramírez, Michelle Rosales India, and Captain Miguel Gómez. In Laguna San Ignacio the research was led by Dr. Sergio Martínez A. accompanied by researchers Floryser Ronzón-Contreras, Minerva Valerio, Alejandra Saavedra, and Andrés González. The UAV-Drones were piloted by Fabian Rodríguez-González.

ABUNDANCE, LAGUNA SAN IGNACIO: After a slow start in January the number of gray whales in Laguna San Ignacio began to increase throughout the month to their greatest abundance in late February.

Figure 1. Counts of single adult whales observed in boat surveys from 2016 to 2021.



The arrival of adult (non-calf) gray whales occurred in mid-January, approximately two weeks later than was observed during 2011-2017 winters, but similar to the last three winters from 2018 to 2020. Departure times were similar to previous years. Maximum adult whale abundance was approximately 175 individuals, greater than those seen in 2020 (Fig. 1, Table 1).

The highest count of single adult whales (breeding males and females without calves) was 162 whales on 27 February survey. Numbers of these whales were similar to those observed in previous winters, with maximum counts ranging from 100 to 200 whales. These counts suggest a possible increasing trend in abundance for the single whales seen in 2020. This increase in the number of single whales is encouraging, however, we continued to observe more “skinny” or “flaca” single whales than we should be seeing (***See Body Condition below***), and speculate that some whales may have been mature breeding females that were unable to produce a calf due to their poor body condition.

Unfortunately, the numbers of female-calf pairs observed in Laguna San Ignacio have remained very low since 2018, suggesting that the reproductive rate of the female whales has declined the beginning of the Unusual Mortality Event (UME) of 2019-2020 (NOAA 2019), and that the UME may be continuing in 2021. Counts of females with calves remained low throughout the entire 2021 winter season, with the greatest number of only19 pairs counted on 18 March 2021; the end of the season increase of female-calf pair counts historically seen in Laguna San Ignacio did not occur in 2021, or during in the previous three winters (Fig. 2, Table 1). The number of female-calf pairs seen in 2021 was less than 50% of the abundance observed

between 2011 to 2017, when female-calf pair counts in March ranged from 50 to 60 pairs to just under 130 pairs.

While the numbers of newborn calves of the year continue to be low, both the calves and their mothers appear to be in good condition and healthy, and not suffering from a lack of food like many of the single whales (***See Body Condition below)***.

Figure 2. Counts of female-calf pairs observed in boat surveys from 2016 to 2021.

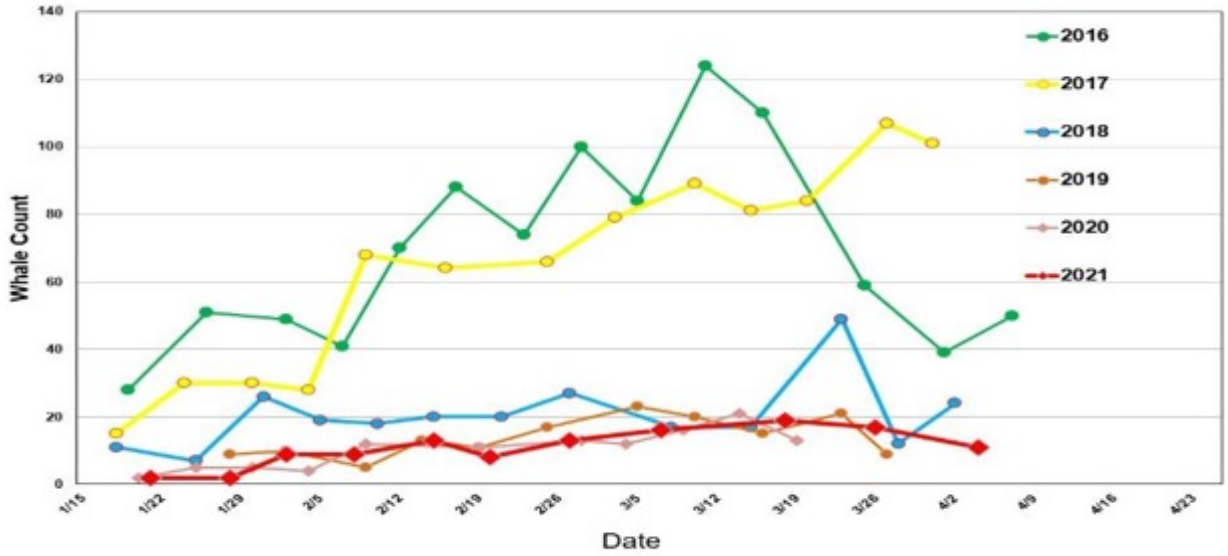


Table 1. Counts of gray whales in Laguna San Ignacio in 2021.

Survey No.	Date	Single Whales	Female Calf pairs	Total Adults
1	21-Jan-21	5	2	7
2	28-Jan-21	10	2	12
3	02-Feb-21	32	9	41
4	08-Feb-21	29	9	38
5	15-Feb-21	65	13	78
6	20-Feb-21	98	8	106
7	27-Feb-21	162	13	175
8	7-Mar-21	101	16	117
9	18-Mar-21	89	19	108
10	26-Mar-21	31	17	48
11	4-Abr-21	8	11	19

See Martínez et al. 2021 for more details of gray whale abundance in Laguna San Ignacio: Informe de Ballena Gris -LSI_WEB-2021.pdf.

*****If you would like to learn more about how we count gray whales in Laguna San Ignacio,* ***click on this link to read*** *a special report that explains how we use boat-based surveys to monitor trends in gray whale abundance, seasonal timing of lagoon occupation, and distribution******

ABUNDANCE, BAHÍA MAGDALENA: In Bahía Magdalena abundance survey counts between January 18 and on March 6 counted a total of 528 single whales were counted in Bahía Almejas 82 single whales in Bahía Magdalena, and 79 single whales in Canal de Santo Domingo. Only 3 female-calf pairs were seen in Bahía Almejas, none in Bahía Magdalena, and 8 female-calf pairs were observed in Canal de Santo Domingo.

The number of gray whales observed in the Bahía Magdalena lagoon complex compared to the previous year (2020) indicates a similar number of single whales occupied these areas in February (587 in 2020 and 528 in 2021). However, the number of female-calf pairs was lower in the current year, with only11 pairs seen in 2021 compared to 17 pairs observed in 2020.

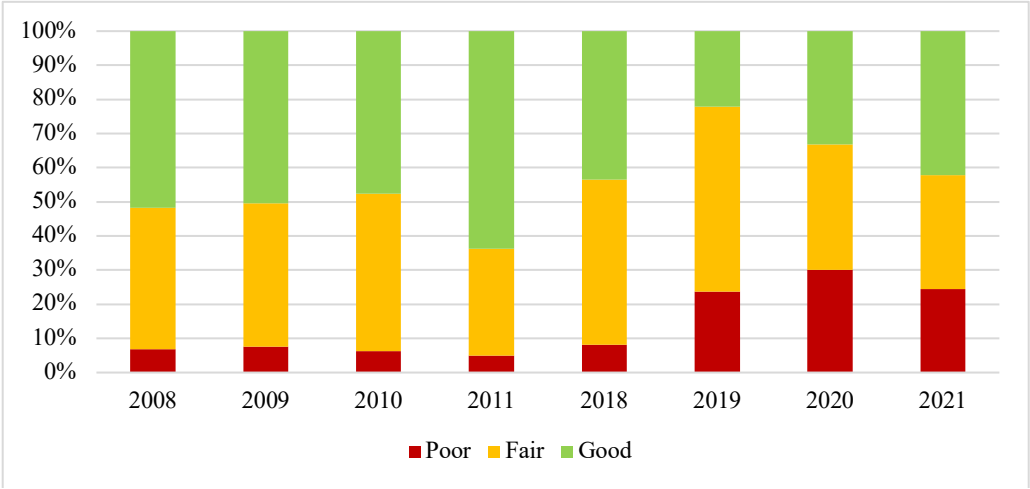
See Viloria et al. 2021 for details of gray whale abundance in the Bahía Magdalena complex.

Table 2. Counts of gray whales observed in boat surveys between January 18 and March 6, 2021 in the Bahía Magdalena lagoon complex, Baja California Sur, Mexico.

Zona / Fecha	Female-Calf Pairs	Single Whales	Total Adults
Bahía Almejas			
18-ene-21	0	19	**19**
06-feb-21	1	190	**191**
26-feb-21	1	165	**166**
05-mar-21	1	154	**155**
Sub total	**3**	**528**	**531**
Bahía Magdalena			
22-ene-21	0	4	**4**
08-feb-21	0	33	**33**
27-feb-21	0	41	**41**
Sub total	**0**	**82**	**82**
Canal Sto. Domingo			
21-ene-21	0	0	**0**
07-feb-21	6	49	**55**
28-feb-21	2	30	**32**
Sub total	8	79	**83**
Total	**11**	**689**	**700**

BODY CONDITION: MORE "SKINNY" WHALES 2021: The trend of declining body condition since the 2018 winter continues to be evident in Laguna San Ignacio (see *Ronzón-Contreras et al. 2021*), and is believed to have contributed to the ongoing gray whale Unusual Mortality Event (UME) (see *Christiansen et al. 2021*). The percentage of "skinny" or "poor condition" single whales observed in the lagoon last winter 2020 was 30%, while the females with calves were in good b condition overall Fig. 3).

Figure 3. Body condition of single gray whales in Laguna San Ignacio from 2008-2011 and 2018-2021.



This winter (2021), a total of 483 individual whales were photographically-identified from digital images taken in January and February. Gray whales in "skinny" or "poor condition" again represented 24.4% of all single whales (n= 615). Interestingly, while "poor condition" single whales predominated, all of the female-calf pairs appear to be in "good" to "fair" condition (n= 43).

Table 3. Body condition of gray whales photographed in Laguna San Ignacio in 2021.

Body Condition of Gray Whales in Laguna San Ignacio During Winter 2021	
Females with calves (total n= 43)	**Percent of Total**
Good Condition (n= 41)	95.3%
Fair Condition (n= 2)	4.6%
Poor Condition (n= 0)	0%
Single Whales (total n= 615)	
Good Condition (n=259)	42.1%
Fair Condition (n=206)	33.5%
Poor Condition (n=150)	24.4%

Gray whales arriving in Baja California each winter presumably have completed the previous summer feeding in the North Pacific, Bering and Chukchi seas, and then in the fall they migrated south to the breeding areas along Baja California's Pacific coast. Gray whales are very efficient swimmers and should arrive on the breeding grounds in very good condition. However, it continues to be alarming that many of them are underweight, and this suggests that the Unusual Mortality Event (UME) is continuing in 2021.

STRANDED WHALES: During the 2021 winter 6 stranded gray whales (2 males, 3 females, and 1 calf) were discovered in Laguna San Ignacio, and 8 adult gray whales (7 males and one female) were discovered in the Bahía Magdalena Bay complex. Prior to 2018, stranded dead whales were mainly calves of the year, and stranded adults were rarely found. With the onset of the gray whale UME, stranded adult whales are more frequently found in the winter breeding lagoons of Baja California (*see Martinez et al 2021*).

*********** Read more about the Gray Whale Unusual Mortality Event at:*
https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2021-gray-whale-unusual-mortality-event-along-west-coast-and **********

DRONE PHOTOGRAPHS ADD MORE GRAY WHALE CONDITION DATA: Surveys using Aerial Vehicles (UAV) could not be carried out during the entire winter from January to April 2021 due to issues related to the COVID-19 pandemic. However, 76 UAV flights (22.15h) were conducted in Laguna San Ignacio from March 2 to 13 at the peak of the winter gray whale season. Body condition measurements (n= 280) were obtained from 180 single individuals (animals with no calf) and 16 female-calf pairs. Growth curves (length and width) will be determined for the calves through the breeding season, as well as estimates of losses and gains in body volume of individual females to estimate the volume conversion efficiency from females to calves, and the maternal energy investment in their calves through the breeding season. ** Read more about UAV-Drone Photogrammetry in 2021 **

The long-term photo-Identification database (41 years) for individual gray whales in Laguna San Ignacio will allow investigation of the relationship between body condition and long-term reproductive history, and reproduction efficiency (calving interval) of breeding female gray whales before and during the UME. This study will provide insights into challenging and complex ecological questions which could not be answered previously.

In 2021 we again observed single "skinny" whales in "poor condition" apparently trying to feed in the lagoon, which would suggest that they were starving. The low spring tides revealed what appeared to be characteristic "feeding pits" in the sandy bottom sediments near the shores, again suggesting that some gray whales were searching for food in the lagoon (Fig. 4).

Figure 4. Apparent "feeding pits" discovered in the shallow sandflats of Laguna San Ignacio.

GRAY WHALE CALF RESCUE: On February 7th, the LSIESP/PRIMMA-UABCS gray whale research team was conducting a routine whale abundance survey in Laguna San Ignacio when they observed a female whale and her calf swimming slowly at the surface and trailing several fishing lines with buoys attached. As the team approached the pair, it became obvious that the

calf had several fishing lines and buoys wrapped around its body, and the weight of this fishing gear was making it very difficult for the calf to swim and surface to breathe.

Under the direction of Field Chief Dr. Sergio Martínez, the team implemented the "RABEN" (Red de Asistencia a Ballenas Enmalladas) protocol, or procedure, to begin the rescue process. In 2014 the Natural Resources Defense Council (NRDC) funded a series of whale disentanglement workshops to train LSIESP researchers and other boat operators in specific methods to safely disentangle large whales from fishing gear.

The team first used a grappling hook to attach a large red float to the fishing lines trailing behind the calf. This float allowed the team to know the location of the calf relative to the boat at all times, and also provided additional resistance to the calf's efforts to dive, and tiring the calf to slow its swimming. At this point the team closely approached the calf and determine that approximately 50 m of lines and floats were wrapped around the calf's body and peduncle. This had to be done carefully because female gray whales have a reputation for aggressively protecting their calves when they perceive the calf is in danger or injured. Fortunately, while this mother whale stood by her calf she did not interfere with the team while they approached the calf to evaluate the degree of entanglement at close range.

Using specially designed knives on poles, the team began cutting the lines wrapped around the calf's body, and then those lines around its peduncle, ultimately freeing the young and exhausted whale. When the fishing lines and floats were recovered, the team discovered two wire lobster traps on the ends of the two 50m long lines with buoys. If this fishing gear were not removed, the gray whale calf would have certainly died. Ironically, the traps contained three lobsters, which were returned to the sea to live another day. This brings the number of rescued gray whales to 7 in Laguna San Ignacio since the disentanglement program began.

WESTERN GRAY WHALES PHOTOGRAPHED IN LAGUNA SAN IGNACIO: We continued to photograph gray whales in both lagoon areas in 2021 and will add these images to the catalogs from 2006 to the present for comparison within Winter seasons and areas. Photo-ID effort in Laguna San Ignacio revealed: 746 singles whales and 43 females with calves visited the lagoon, with an average duration of stay for single whales at 9.3 days & for females with calves 36.4 days. In Bahía Magdalena the average duration of stay for 506 single whales was 8 days, and for 6 female calf pairs was 19 days. Three whales known to be from the Western North Pacific population were photographed in Laguna San Ignacio; individual whales from the Western North Pacific population have been previously documented by radio-tagging and photo-ID to migrate to Baja California during the winter months. This year was no exception as three "Western" gray whales were photographed in Laguna San Ignacio during the breeding season (Figs. 5a-c).

Figures 5a-c. Western North pacific gray whales photographed in Laguna San Ignacio during the 2021 winter breeding season: 21-0399-D-LSI / WGW 084, 21-0720-D-LSI / WGW 052 Y 21-0749-D-LSI / WGW 068.

OTHER CETACEANS DOCUMENTED IN LAGUNA SAN IGNACIO AND BAHÍA MAGDALENA:
A number of cetacean species were observed within the lagoon areas during the 2021 winter. These included a humpback whale (*Megaptera novaeangliae*), bottlenose (*Tursiops truncatus*) and common dolphin (*Delphinus delphis*) in Laguna San Ignacio, and humpback whales, bottlenose, common, and Pacific whitesided dolphin (*Lagenorhynchus obliquidens*) in the Bahía Magdalena complex (Figs. 6a-d).

Figure 6a. Pacific whitesided dolphin (*Lagenorhynchus obliquidens*)

Figure 6b. Bottlenose dolphin (*Tursiops truncatus*)

Figure 6c. Humpback whale (*Megaptera novaeangliae*)

Figure 6c. Common dolphin (*Delphinus delphis*)

YOU CAN MAKE IT HAPPEN: We are grateful to our family of sponsors whose generous support each year allows the laguna San Ignacio Ecosystem Science Program to conduct research on gray whales and their lagoon aggregation and breeding areas in Baja California. We urge you to consider becoming a supporter of our program by making a monthly donation through our fiscal sponsor The Ocean Foundation. Setting up your monthly donations is safe and secure at the following link:

https://www.sanignaciograywhales.org/donate/. Thank You!

ACKNOWLEDGEMENTS: Despite the restrictions of conducting field research during the COVID-19 pandemic, our researches were able to work and gather fundamental data on gray whale abundance and health while maintaining their personal safety by social distancng, and keeping their physical isolation from other public visitors, and local community members at both study sites. The authors wish to thank all of the research teams from the Laguna San Ignacio Ecosystem Science Program and the Programa de Investigación de Mamíferos Marinos, Universidad Autónoma de Baja California Sur, La Paz, B.C.S., México that have worked to monitor the gray whales that reside within in Laguna San Ignacio and Bahía Magdalena during the winter months. This research was supported by grants from The Marisla Foundation, the Ocean Foundation, Natural Habitat Adventures Foundation, the Whaleman Foundation, and private individual donors, with in-kind support for logistics provided by Kuyima Eco-Tourismo, Inc. Field research was conducted under Scientific Research permits No. SGPA/DGVS/00658 from the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), Subsecretaría de Gestión Para La Protectión Ambiental, Dirección General De Vida Silvestre, de México.

QUESTIONS OR WANT MORE INFORMATION ?: please contact us on our website and we will do our best to address your questions and provide more information on the gray whales and their winter breeding lagoons in Baja California:
https://www.sanignaciograywhales.org/contact-us/.

RECENT PUBLICATIONS RELEVANT TO NORTH EASTERN PACIFIC GRAY WHALES:

Christiansen, F., *et al.* (2021). Poor body condition associated with an unusual mortality event in gray whales. Marine Ecology Progress Series Vol. 658:237-252.

Huntington, et al. (2020). Evidence suggests potential transformation of the Pacific Arctic ecosystem in underway. Natural Climate Change, www.nature.com/natureclimatechange; https://doi.org/10.1038/s41558-020-0695-2.

Martínez-Aguilar, S., Casanovas-Gamba,P., Farriols-García, M., González-Cisneros, A., Heaven, J.D., Castillo-Romero, F., Zaragoza-Aguilar, G.A., Rivera-Rodríguez, J., Mariano-Meléndez, E., López-Paz, N., Huerta-Patiño, R., Swartz, S., Viloria-Gómora, L. and Urbán R., J. (2021). Gray whale stranding records in Mexico during the 2020 winter breeding season. Report to the International Whaling Commission, SC/68C/CMP11.

Martínez A., S., Swartz, S., Urbán R., J., Ronzón, F., González, A., Valerio, M., Saavedra, A., and Rodríguez, F. (2021). Informe de las actividades del Monitoreo de la Ballena Gris (*Eschrichtius robustus*) temporada Invernal 2021. Laguna San Ignacio, B.C.S. México. Laguna San Ignacio Ecosystem Science Program: https://www.sanignaciograywhales.org/research/publications/

Ronzón-Contreras, F., Martínez-Aguilar, S., Swartz, S., and Urbán R, J. (2021). Gray whales body condition in Laguna San Ignacio, BCS, Mexico, during 2021 breeding season. Report to International Whaling Commission, SC/68C/CMP12.

Silber, G. K., *et al.* (2021). Co-occurrence of gray whales and vessel traffic in the North Pacific. Endangered Species Research. Vol. 44:177-201.

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Urban, et al. (*In Press*) Migratory behavior of an Eastern North Pacific gray whale from Baja California Sur to Chirikov Basin, Alaska. Frontiers Online Publication.

Urbán R., J.[1], Swartz, S.L.[2], Martínez A, S.[1], and Viloria G., L.[1], and Ronzón-Contreras, F. (2021). 2020 gray whale abundance in Laguna San Ignacio and Bahía Magdalena, Baja California Sur, Mexico. Report to International Whaling Commission, SC/68C/CMP11.

Viloria Gómora L., Omar Castañeda G, Mario Márquez S., Swartz, S. and Urbán R., J. (2021). Reporte de investigación del monitoreo de ballena gris en su estancia invernal en el complejo lagunar Bahía Almejas, Bahía Magdalena, y Canal de Santo Domingo 2021. Laguna San Ignacio Ecosystem Science Program: https://www.sanignaciograywhales.org/research/publications/

Photo by Sergio Martínez A. The Milky Way viewed from our field research camp on the south shore of Laguna San Ignacio.