

Gray Whale (*Eschrichtius robustus*) Stranding Records in Mexico During the Winter Breeding Season in 2019.

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ABSTRACT

While the occasional death and stranding of gray whales occurs as part of their life cycle, sometimes unusual mortality events occur (UME). The specific cause of the 1999 – 2000 UME for gray whale was undetermined, but some evidence suggests that a decline in body condition resulting from nutritional stress (lack of sufficient food) may have contributed to the increase in gray whale mortality by starvation. Since that event, the incidence of gray whale strandings decreased throughout the species range in the North Pacific. Information collected between December 2018 and April 2019 from four sources in Mexico reported 73 gray whales stranded along the Pacific coast of Baja California and the Gulf of California, Mexico. 83.5% of the dead whales were encountered in Laguna Ojo de Liebre (Scammon's lagoon) and the surrounding areas. Forty-four of these were female gray whales, 16 were males and 13 were of undetermined sex. The age classes of the dead whales were: 28 adults, 39 subadults, 2 calves and 4 of unknown age/sex. Compared to mortalities reported in previous years from 2012-2018, the number of stranded calves decreased, but the number of dead gray whales sub-adults and adults increased. In relation to sex, the number of females stranded also increased during this year. A similar increase in gray whale mortalities was observed in 1999-2001. This high number of gray whale stranding in 2019 appears to be related to the decline in body condition evident in numerous gray whales observed in the gray whale's winter aggregation areas and breeding lagoons. The examination of environmental data from the whales' summer feeding grounds is needed to establish any significant correlation with this increase in mortality.

INTRODUCTION

The natural death of marine mammals can be related to: predation, parasitism, disease and starvation (Cardenas, 2004), and other anthropogenic causes such as hunting, entanglements in fishing gear, poisoning and trauma (Evans, 1987). The gray whale is the species of mysticetes that aggregate and migrate along and in the continental shelf waters, which brings these whales into close contact with human development. This coastal distribution also frequently allows stranded gray whales to wash ashore and be discovered, rather than lost at sea.

Previous reports of stranded gray whales in Mexico include:

Swartz and Jones (1983) estimated that 5.4% of gray whale calves of the year die near or in the lagoons, and an additional 31% of calf mortality occurs by the time they reach central California. Jones and Swartz (1984) also published records of gray whale strandings in their Mexican breeding 1954 to 1983.

Sanchez (1984) analyzed the gray whale stranding from 1984 to 1995 and he found that 191 whales stranded in this period and 34% of the stranding occur on Arena Island (Northern entrance of Laguna Ojo de Liebre (Scammon's lagoon).

In 1999 a total of 112 stranded dead whales were reported along the whales' breeding and aggregation areas in Mexico, and in 2000 an additional 207 stranded whales were reported. At the same time, some of the stranded whales appeared to be "skinny" and very thin suggesting that they were suffering from nutritional stress, starvation (Cardenas, 2004). In Moore *et al.* (2001), suggested that the North Eastern Pacific gray whale population could be reaching the "carrying capacity" of the gray whales' feeding grounds.

Subsequently, effort to monitor and report gray whales stranding throughout their range in Mexico have been undertaken. Nevertheless, many isolated areas occur along the Pacific coast of Mexico where is difficult to discover and report additional whale strandings. Thus, the numbers of dead stranded gray whales reported here can be considered a minimum. Additional collaboration among institutions in Mexico is needed to obtain a more complete understanding of trends in gray whale mortalities in this region of their range.

METHODS

Information on dead stranded gray whales was collected from four sources, and whenever possible, data was recorded with the following details: Date, GPS position, location, number of whales, sex, age class, body length and physical condition (good, fair, or poor/skinny). The age categories were established by body length: calves from 4.2 to 7-m; sub-adults from 7.1-m to 10-m, and adults as more than 10.1-m long.

Sources of stranding data for 2019 included:

1.- Strandings in Bahía de La Paz, Laguna San Ignacio and Puerto Chale, BCS., were recorded by members of LSIESP and PRIMMA/UABCS (Laguna San Ignacio Ecosystem Science Program and Marine Mammals Research Program / Universidad Autónoma de Baja California Sur). This information was collected from January 15 to March 28, 2019 during the field work or from reports of boat operators.

2.- Strandings from Laguna Ojo de Liebre (Scammon's Lagoon), Laguna Guerrero Negro, BCS and Laguna Manuela, Baja California) were reported by the staff of Exportadora de Sal S.A. in collaboration with staff from Biosfera Reserve "El Vizcaino" (SEMARNAT). This information was collected from December 17, 2018 to April 11, 2019 during stranding surveys made periodically throughout the winter.

3.- Four stranding records (two in Malarrimo Beach and two in the north part of Laguna Ojo de Liebre (Scammon's lagoon), were recorded during an aerial survey for marine mammals as part of the project "Centro Mexicano de Innovación en Energía" – Océano (CEMIE-Océano), directed by Gisela Heckel. Information was collected on April 24, 2019.

4.- Five gray whale strandings were reported from San Felipe (in the upper Gulf of California), Ensenada and the Pacific Coast of Baja California by the "Review of News", in newspapers and in internet websites. These reports were later confirmed by Mexican government reports, and eye-witness accounts. This information was collected between January 23 to April 19, 2019.

RESULTS

In the Pacific Coast of Mexico and Gulf of California between December 17 and April 24 of 2019; 73 gray whales were reported dead and stranded: 71 along the Pacific coast of Baja California Peninsula, and 2 inside of Gulf of California (Fig. 1). Of these whales, 44 were females, 16 were males, and 13 were of undetermined (Table 1). Separating these whales by age categories, there were 28 adults, 39 subadults, 2 calves and 4 unknown whales that were seen from a small aircraft. (Table 2).

Of the total number of whales stranded, 83.5% were reported in Laguna Ojo de Liebre (Scammon's Lagoon) and the surrounding areas. Advanced decomposition of most of these whales prevented determination of body condition at the time of their deaths (e.g., "good", "fair", or "poor" condition could not be confirmed).

Gulf of California

Strandings of dead gray whales inside the Gulf of California are not common, The Marine Mammals Research Program (PRIMMA-UABCS) has recorded 7 stranding in Bahía de La Paz from 1979 to 2008. Since that time there have not been new stranding

reports until this year, where a gray whale stranded in Gulf of California upper region (San Felipe, Baja California) and another stranded in Bahía de La Paz.

Bahía Magdalena lagoon complex

Bahía Magdalena is located to the south of San Ignacio Lagoon. In the winter of 2019 a total of 2 stranded dead gray whales were discovered: 1 was a female and the other was a male, both adults (Fig.1).

Laguna San Ignacio.

In Laguna San Ignacio, Baja California Sur, there have been 33 gray whale strandings between 2009 to 2018: 14 were females, 13 males and 6 of undetermined sex. These included: 9 adults, 1 subadult, 1 yearling, and 21 calves (Table 3). During the 2019 winter gray whale breeding season 2 adult females in good body condition, and 2 adults of undetermined sex were discovered dead and stranded inside the lagoon.

Laguna Ojo de Liebre (Scammon's lagoon), Laguna Guerrero Negro y Laguna Manuela

These 3-lagoons are located within the northern portion of the "El Vizcaíno" Biosphere Reserve. In the winter of 2019 a total of 61 stranded dead gray whales were discovered: 40 were females, 12 were males, and 9 were of undetermined sex (Fig. 2). The age classes of these whales included: 2 calves, 35 subadults, 20 adults, and 4 observed during aerial surveys were of undetermined age (Fig. 3).

DISCUSSION

The highest percent of the stranded dead gray whales were reported from Laguna Ojo de Liebre (Scammon's Lagoon) and the surrounding areas (Fig. 1). These stranded whales could be expected because this lagoon is the largest gray whale aggregation and breeding lagoon area in Baja California Peninsula. During a regular season this lagoon normally can have 2000 or more gray whales in its interior. Nevertheless, the low number of stranded calves (n=2) compared to the range of 4-44 dead calves observed between the 2012 and 2018 winters, suggests that there were fewer calves produced this past winter, or females with new-born calves did not enter or utilize this lagoon. In addition, the 2x to 3x increase in the number of stranded sub-adults and adults was unexpected and unusual (Fig.3).

The low number of calves of the year and the increase in the number of stranded sub-adult and adult gray whales could be related to a decline in overall body condition of the

whales (Ronzón-Contreras *et al.* 2019), as observed during their winter southward migration and in the breeding lagoons. Unfortunately, due to the advanced decomposition of many of the stranded whales examined, a correlation with "poor" body condition could not be established or confirmed in all of the whales examine (Table 1).

Sub-adult and adult females comprised 60.2% (n=44) of all the stranded whales reported in Mexico (Table 2). This loss of breeding females could affect the production and the recruitment of new calves for the Eastern North Pacific gray whales population in the future. Continued monitoring of the calving interval for gray whales in Mexico may give an indication of any change in calf production that could result for this loss of female whales. Similar decreases in numbers of calves seen in the breeding lagoons followed the UME of 1999-2000 (Le Boeuf *et al.* 2002, Gulland *et al.* 2005, Urbán *et al.* 2003, 2011). Since 2011 the number of female-calf pairs observed in Laguna San Ignacio has increased, until the winters of 2018 and 2019 (Urbán *et al.* 2019). The number of females with calves observed in Laguna San Ignacio was 86 in 2018 (Ronzón-Contreras *et al.*, 2019) and was 41 in 2019 (Urbán *et al.*, 2019), the lowest number of calves reported in Laguna San Ignacio since 2010 when only 37 female-calf pairs were reported.

Inside of the Gulf of California, there were two stranded gray whales in 2019, compared to only seven records of stranded gray whales in Bahia de la Paz between 1979 and 2008. These unusual strandings could be related to: the lower than normal water temperatures reported inside Ojo de Liebre and San Ignacio lagoons in 2019; observations of gray whale "feeding behavior" in the breeding and calving areas where little prey species are known to occur during the winter months; and the southern extension of the gray whale' migration into the Gulf of California, including: Los Cabos, Bahia de la Paz, Loreto, San Felipe and Mazatlán; and Puerto Vallarta along the Mexican mainland coast.

In Laguna san Ignacio, The Laguna San Ignacio Ecosystem Science Program has reported all the stranding events since 2009 during the winter occupation of this lagoon by gray whales. The number of stranding events has ranged from 1 to 7 whales annually, and the four stranded whales discovered in 2019 was not unusual. What was unusual and similar to observations in Laguna Ojo de Liebre, were the low number of calves, stranded or reported alive with female gray whales. In previous winters, the largest number of stranded gray whales were calves of the year (n=21); in 2019 few calves were observed, and the only stranded whales were adults (2 females in good body condition and 2 of undetermined sex).

The number of stranding events can be underestimated by the differences in detectability and effort done along the Baja California Peninsula and also because of the environmental factors as tides and marine currents that can move the carcasses before they can be discovered and reported.

The connection between the increment of fair and poor body condition in the migration route and breeding areas (Ronzón-Contreras, *et al.* 2019), and the high numbers of stranding events including a majority of sub-adults and adults whales, is similar to observations during and following the 1999-2000 UME event, and seems to reflect gray whales are encountering difficulty obtaining sufficient sources of food in their feeding areas in their North Pacific and Arctic. Change in environmental conditions could affect the production and availability of prey for gray whales during their summer feeding period in the higher latitude portions of their range. Additional information and data from the gray whales' feeding grounds is needed to better characterize and to understand these events.

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Tables and Figures

Figure 1. Distribution of gray whales stranded in Baja California Peninsula, in Mexico. from December 2018 to April 2019. (the zoom square corresponds to Laguna Ojo de Liebre (Scammon's lagoon) at the bottom, Laguna Guerrero in the middle and Laguna Manuela at the Top).

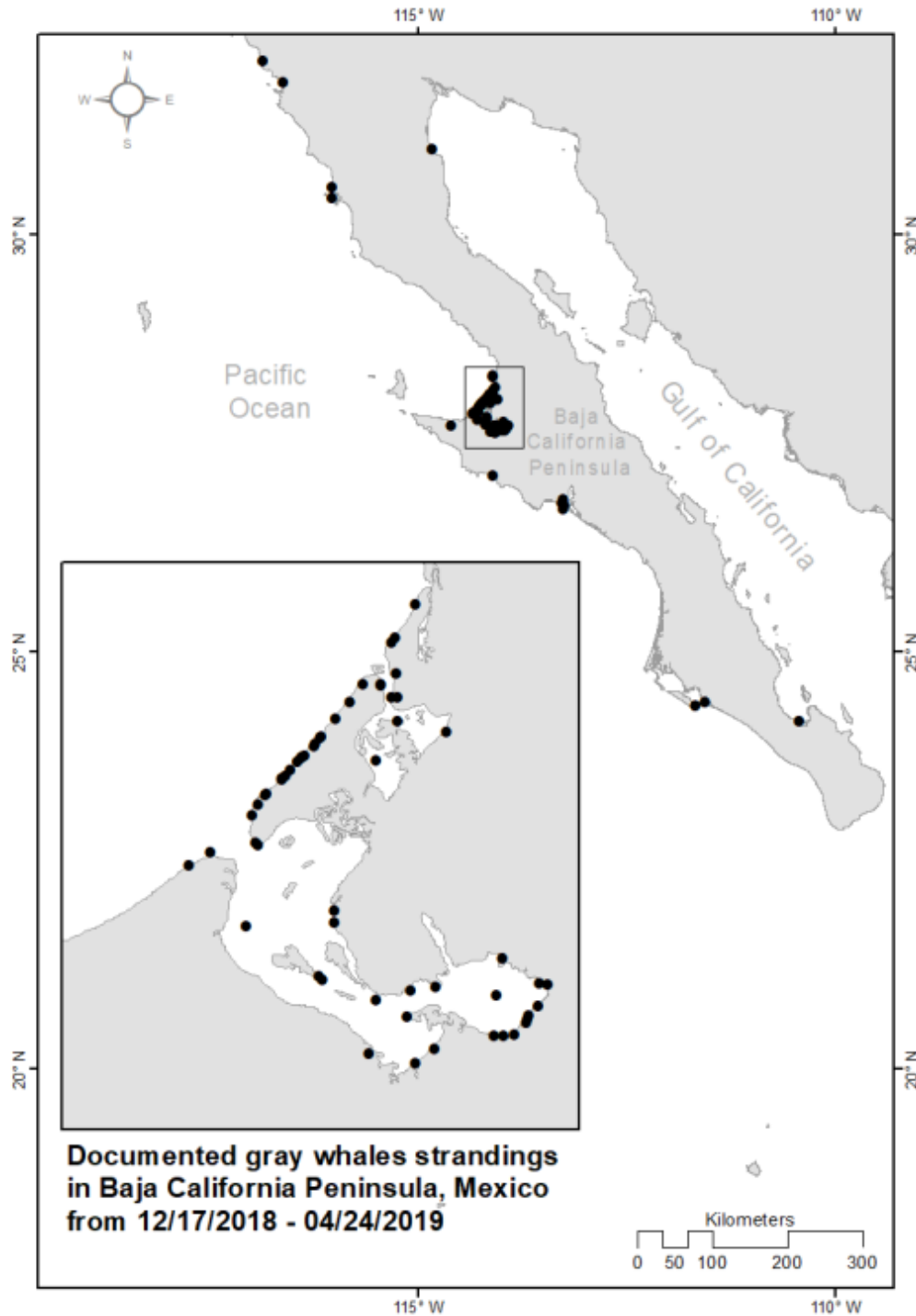


Figure 2. Total number of gray whales stranded in Ojo de Liebre, Guerrero Negro and Manuela Lagoons separated by sex categories and years.

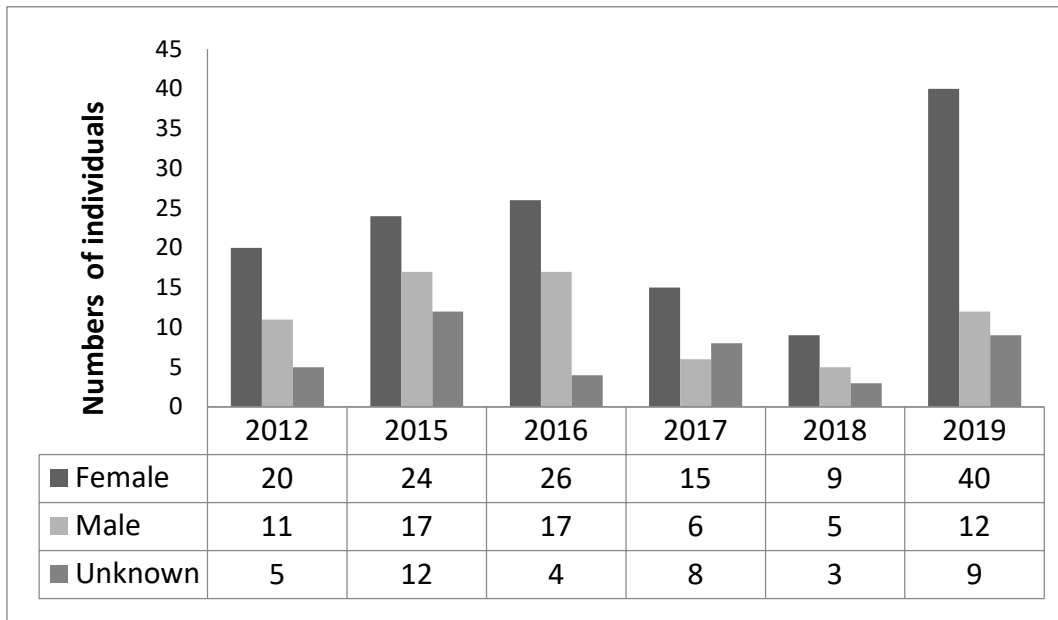


Figure 3. Total number of gray whales stranded in Ojo de Liebre, Guerrero Negro and Manuela Lagoons separated by age categories and years.

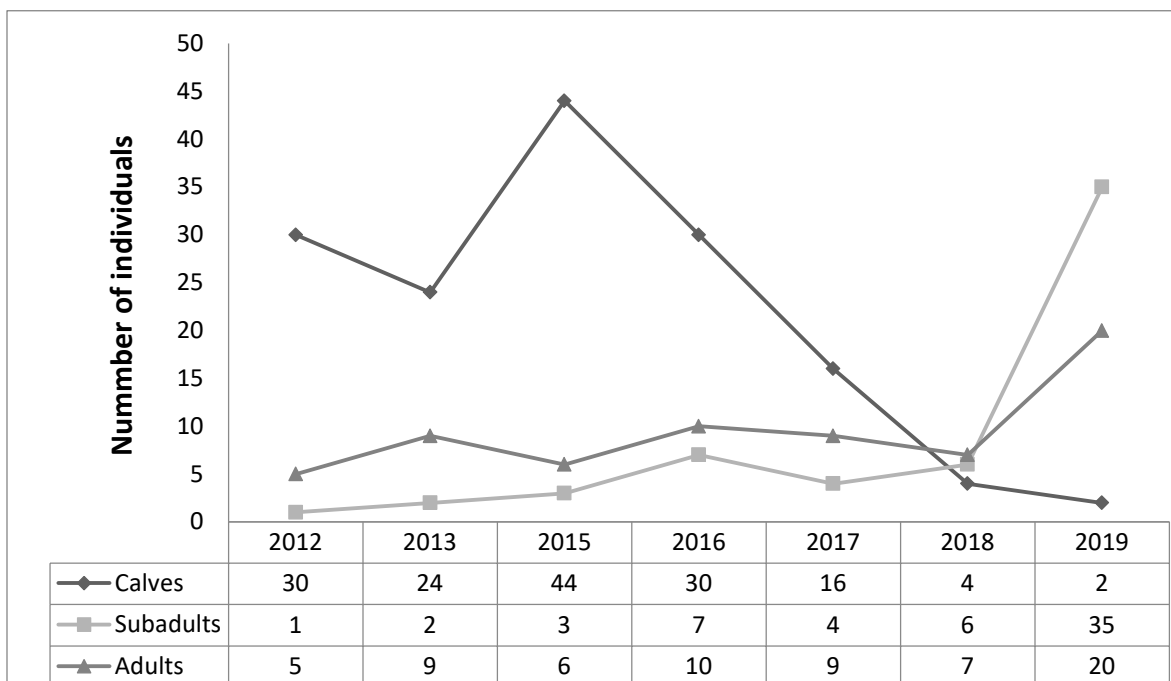


Table 1. Data from gray whales stranded in México from December 2018 to April 2019. (Field ID: ESSA/REBIVI are data collected by Exportadora de Sal S.A and Biosphere Reserve El Vizcaíno; PRIMMA are data collected by Marine Mammals Research Program; CEMIE data collected by Centro Mexicano de Innovación en Energía.) (B. C. S. =Baja California Sur; B.C.= Baja California; Unk=Unknown). The empty cell in Field ID corresponds to data from news, news papers and the Web.

Date	Field ID	Province	Sex	Age Class	Length	Observation Status	Locality	Latitude	Longitude	How Observed	Notes
17-dic-18	ESSA/REBIVI 1	B. C. S.	M	subadult	8.2 m	Advanced Decomposition	Isla Arena, Laguna Guerrero Negro	28.07833	-114.11861	Beach or Land	
19-dic-18	ESSA/REBIVI 2	B. C. S.	F	subadult	8.3 m	Advanced Decomposition	Punta Mariscal, Laguna Ojo de Liebre	27.71222	-114.08333	Floating	
04-ene-19	ESSA/REBIVI 3	B. C. S.	Unk	subadult	9.2 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	28.07972	-114.14055	Beach or Land	
04-ene-19	ESSA/REBIVI 4	B. C. S.	F	subadult	9.4 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.99194	-114.21277	Beach or Land	
04-ene-19	ESSA/REBIVI 5	B. C. S.	F	subadult	9.0 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.96722	-114.23694	Beach or Land	
07-ene-19	ESSA/REBIVI 6	B. C. S.	F	adult	11.0 m	Advanced Decomposition	Laguna Ojo de Liebre	27.72611	-114.18944	Floating	
10-ene-19	ESSA/REBIVI 7	B. C. S.	F	subadult	8.8 m	Advanced Decomposition	Laguna Ojo de Liebre	27.68166	-114.08805	Floating	
10-ene-19	ESSA/REBIVI 8	B. C. S.	F	subadult	7.9 m	Advanced Decomposition	Laguna Ojo de Liebre	27.70111	-114.12555	Floating	
15-ene-19	PRIMMA 1	B. C.	M	adult	12 m	Advanced Decomposition	Isla Ana, Laguna San Ignacio	26.71399	-113.26267	Beach or Land	Skinny
15-ene-19	ESSA/REBIVI 9	B. C.	M	adult	10.7 m	Advanced Decomposition	Playon de Laguna Manuela	28.12972	-114.10666	Beach or Land	
22-ene-19	ESSA/REBIVI 10	B. C. S.	F	subadult	8.2 m	Advanced Decomposition	Campo pesquero el Dátil	27.80861	-114.17472	Beach or Land	
22-ene-19	ESSA/REBIVI 11	B. C. S.	F	subadult	8.5 m	Advanced Decomposition	Campo pesquero el Dátil	27.79416	-114.17472	Beach or Land	
23-ene-19		B. C.	F	subadult	8.7 m	Moderate Decomposition	Escollera del puerto de San Felipe	31.02648	-114.83132	Beach or Land	Data from the web
05-feb-19	PRIMMA 2	B. C. S.	M	adult	12.6 m	Advanced Decomposition	Frente a Punta Piedra, laguna San Ignacio	26.77827	-113.26793	Beach or Land	Good body condition (not skinny)
07-feb-19	ESSA/REBIVI 12	B. C. S.	M	adult	11.9 m	Advanced Decomposition	Poza del muerto, Laguna Ojo de Liebre	27.71750	-114.05361	Beach or Land	

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15-feb-19	ESSA/REBIVI 13	B. C. S.	M	calf	4.3 m	Advanced Decomposition	Isla alambre, Laguna Ojo de Liebre	27.72944	-114.19305	Beach or Land	
25-feb-19	PRIMMA BM 1	B. C. S.	F	adult	Unk	Advanced Decomposition	Entrada a Puerto Chale	24.39351	-111.55854	Beach or Land	
25-feb-19	PRIMMA BM 2	B. C. S.	M	adult	Unk	Advanced Decomposition	Isla Creciente, Bahía Magdalena	24.35848	-111.66967	Beach or Land	
28-feb-19	ESSA/REBIVI 14	B. C. S.	F	adult	12.4 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.88638	-114.26666	Beach or Land	
28-feb-19	ESSA/REBIVI 15	B. C. S.	M	adult	11.1 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.88972	-114.26944	Beach or Land	
28-feb-19	ESSA/REBIVI 16	B. C. S.	M	subadult	8.2 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.92277	-114.27333	Beach or Land	
28-feb-19	ESSA/REBIVI 17	B. C. S.	F	adult	14.3 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.94638	-114.25833	Beach or Land	
28-feb-19	ESSA/REBIVI 18	B. C. S.	Unk	adult	13.7 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.94888	-114.25611	Beach or Land	
28-feb-19	ESSA/REBIVI 19	B. C. S.	Unk	adult	12.8 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.96500	-114.23833	Beach or Land	
28-feb-19	ESSA/REBIVI 20	B. C. S.	F	subadult	9.8 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.97722	-114.22777	Beach or Land	
28-feb-19	ESSA/REBIVI 21	B. C. S.	F	adult	13.2 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.98694	-114.21916	Beach or Land	
28-feb-19	ESSA/REBIVI 22	B. C. S.	M	subadult	8.7 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.99083	-114.21444	Beach or Land	
28-feb-19	ESSA/REBIVI 23	B. C. S.	Unk	calf	4.4 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	28.00472	-114.19972	Beach or Land	
28-feb-19	ESSA/REBIVI 24	B. C. S.	F	adult	14.2	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	28.01500	-114.19166	Beach or Land	
28-feb-19	ESSA/REBIVI 25	B. C. S.	F	adult	13.7	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	28.01638	-114.19083	Beach or Land	
28-feb-19	ESSA/REBIVI 26	B. C. S.	M	subadult	8.1 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	28.05861	-114.15638	Beach or Land	
01-mar-19	ESSA/REBIVI 27	B. C. S.	F	subadult	8.1 m	Advanced Decomposition	Playon de Laguna Guerrero Negro	28.06333	-114.09916	Beach or Land	
01-mar-19	ESSA/REBIVI 28	B. C. S.	F	subadult	8.3 m	Advanced Decomposition	Playon de Laguna Guerrero Negro	28.09250	-114.10083	Beach or Land	
01-mar-19	ESSA/REBIVI 29	B. C. S.	F	adult	13 m	Advanced Decomposition	Playon de Laguna Guerrero Negro	27.10750	-114.10083	Beach or Land	

01-mar-19	ESSA/REBIVI 30	B. C.	F	subadult	8.5 m	Advanced Decomposition	Playon de Laguna Manuela	28.13527	-114.10250	Beach or Land	
01-mar-19	ESSA/REBIVI 31	B. C.	M	subadult	9.8 m	Advanced Decomposition	Playon de Laguna Manuela	28.17500	-114.07750	Beach or Land	
01-mar-19	ESSA/REBIVI 32	B. C. S.	F	subadult	9.1	Advanced Decomposition	Playon de Laguna Guerrero Negro	28.06444	-114.10583	Beach or Land	
01-mar-19	ESSA/REBIVI 33	B. C. S.	F	adult	14.0 m	Advanced Decomposition	zacatales, de Laguna Guerrero Negro	28.03583	-114.09916	Beach or Land	
02-mar-19		B. C. S.	F	adult	11 m	Advanced Decomposition	Playa Punta Mazo	30.43694	-116.02805	Beach or Land	
03-mar-19	PRIMMA BLP 1	B. C. S.	Unk	subadult	10 m	Fresh Dead	El Mogote, Bahía de La Paz	24.17388	-110.42111	Beach or Land	Skinny
05-mar-19	ESSA/REBIVI 34	B. C. S.	F	adult	12.9 m	Advanced Decomposition	Islote conchalito, Laguno Ojo de Liebre	27.78916	-114.28000	Floating	
05-mar-19	ESSA/REBIVI 35	B. C. S.	F	adult	11.0 m	Advanced Decomposition	zacatales, de Laguna Guerrero Negro	27.63722	-114.13388	Floating	
05-mar-19	ESSA/REBIVI 36	B. C. S.	F	subadult	9.8 m	Advanced Decomposition	La choya, Laguna Ojo de Liebre	27.62527	-114.07722	Floating	
05-mar-19	ESSA/REBIVI 37	B. C. S.	F	subadult	10.0 m	Advanced Decomposition	La choya, Laguna Ojo de Liebre	27.64250	-114.05527	Beach or Land	
05-mar-19	ESSA/REBIVI 38	B. C. S.	M	subadult	8.5 m	Advanced Decomposition	Retobado, Laguna Ojo de Liebre	27.65805	-113.98305	Beach or Land	
05-mar-19	ESSA/REBIVI 39	B. C. S.	M	subadult	9.0 m	Advanced Decomposition	Retobado, Laguna Ojo de Liebre	27.65861	-113.97222	Beach or Land	
05-mar-19	ESSA/REBIVI 40	B. C. S.	F	subadult	8.5 m	Advanced Decomposition	Retobado, Laguna Ojo de Liebre	27.65944	-113.95888	Beach or Land	
05-mar-19	ESSA/REBIVI 41	B. C. S.	F	subadult	9.2 m	Advanced Decomposition	Ondable de las 8 bombas, Laguna Ojo de L.	27.67472	-113.94500	Beach or Land	
05-mar-19	ESSA/REBIVI 42	B. C. S.	F	subadult	8.3 m	Advanced Decomposition	Ondable de las 8 bombas, Laguna Ojo de L.	27.67833	-113.94333	Beach or Land	
05-mar-19	ESSA/REBIVI 43	B. C. S.	F	subadult	8.7 m	Advanced Decomposition	Ondable de las 8 bombas, Laguna Ojo de L.	27.68277	-113.94194	Beach or Land	
05-mar-19	ESSA/REBIVI 44	B. C. S.	F	adult	14 m	Advanced Decomposition	Muelle inglés, laguna Ojo de Liebre	27.69472	-113.93055	Beach or Land	
05-mar-19	ESSA/REBIVI 45	B. C. S.	F	subadult	8.2	Advanced Decomposition	Muelle inglés, laguna Ojo de Liebre	27.71916	-113.92000	Beach or Land	
05-mar-19	ESSA/REBIVI 46	B. C. S.	F	subadult	9.1	Advanced Decomposition	Muelle inglés, laguna Ojo de Liebre	27.72111	-113.92972	Beach or Land	

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05-mar-19	ESSA/REBIVI 47	B. C. S.	F	adult	14 m	Advanced Decomposition	Ondable del uno, Laguna Ojo de Liebre	27.70638	-113.98111	Floating	
05-mar-19	ESSA/REBIVI 48	B. C. S.	F	subadult	8.0 m	Advanced Decomposition	Punta Mariscal, Laguna Ojo de Liebre	27.70750	-114.60194	Beach or Land	
08-mar-19	ESSA/REBIVI 49	B. C. S.	F	subadult	9.5	Advanced Decomposition	Campo don Ramón, Laguna Guerrero Negro	28.02222	-114.04055	Beach or Land	
12-mar-19	ESSA/REBIVI 50	B. C. S.	M	subadult	9.9 m	Advanced Decomposition	Ondable de las Casitas, Laguna Ojo de Liebre	27.98750	-114.12500	Beach or Land	
17-mar-19	PRIMMA 3	B. C. S.	F	adult	12.8	Moderate Decomposition	Bajo del Mapache, Laguna San Ignacio	26.83212	-113.26057	Beach or Land	good body conditioin (not skinny)
22-mar-19	PRIMMA 4	B. C. S.	Unk	adult	Unk	Moderate Decomposition	Frente a Isla Abaroa, Laguna San Ignacio	26.76274	-113.23765	Floating	
23-mar-19	ESSA/REBIVI 51	B. C. S.	Unk	subadult	8.3 m	Advanced Decomposition	campo el uno, Laguna Ojo de Liebre	27.75138	-113.97333	Beach or Land	
07-abr-19		B. C.	Unk	subadult	Unk	Fresh Dead	Playa Hermosa, Ensenada	31.83241	-116.61081	Beach or Land	data from the web
11-abr-19	ESSA/REBIVI 52	B. C. S.	F	subadult	8.3 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	28.07916	-114.11888	Beach or Land	
11-abr-19	ESSA/REBIVI 53	B. C. S.	F	subadult	8.6 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	28.03750	-114.17333	Beach or Land	
11-abr-19	ESSA/REBIVI 54	B. C. S.	F	adult	12.8 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	28.00805	-114.19722	Beach or Land	
11-abr-19	ESSA/REBIVI 55	B. C. S.	F	subadult	8.6 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.99388	-114.21083	Beach or Land	
11-abr-19	ESSA/REBIVI 56	B. C. S.	F	adult	12.8 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.96972	-114.23333	Beach or Land	
11-abr-19	ESSA/REBIVI 57	B. C. S.	F	adult	14 m	Advanced Decomposition	Isla Arena, Laguna Ojo de Liebre	27.93527	-114.26638	Beach or Land	
16-abr-19		B. C.	Unk	subadult	10 m	Advanced Decomposition	Playa la Campana 44 km north from Ensenada	32.08528	-116.85805	Beach or Land	data from the web
19-abr-19		B. C.	M	adult	12 m	Advanced Decomposition	Valle de San Quintin 190 km South from Ensenada	30.56527	-116.03638	Beach or Land	data from the web
24-abr-19	CEMIE-Océano 1	B. C. S.	Unk	Unk	Unk	Advanced Decomposition	Norte de Laguna Manuela	28.29649	-114.10692	Beach or Land	
24-abr-19	CEMIE-Océano 2	B. C. S. Sur	Unk	Unk	Unk	Advanced Decomposition	Norte de Laguna Manuela	28.30936	-114.10104	Beach or Land	
24-abr-19	CEMIE-Océano 3	B. C.	Unk	Unk	Unk	Advanced	Playa Varadero Malarrimo	27.86307	-114.34933	Beach or Land	

						Decomposition					
24-abr-19	CEMIE-Océano 4	B. C.	Unk	Unk	Unk	Advanced Decomposition	Playa Varadero Malarrimo	27.87767	-114.32394	Beach or Land	

Table 2. Total number of gray whales stranded in Mexico (Dec 2018 – April 2019) separated by sex and age categories.

Sex	Age categories	length range (m) registered	total number
Females	adults	11.0 - 14.3	18
Females	subadults	7.9 - 10.0	26
Males	adults	10.7 - 12.6	7
Males	subadults	8.1 - 9.9	8
Males	calves	4.3	1
Unknown	adults	12.8 - 13.7	3
Unknown	subadults	8.3 - 9.2	5
Unknown	calves	4.4	1
Unknown	unknown	unknown	4

Table 3. Total number of gray whales stranded in Laguna san Ignacio, BCS. (2009-2018) separated by sex and age categories.

Sex	Age categories	length range (m)	total number
Female	Adults	12.3 - 12.9	5
Female	calf	4 - 5.1	9
Male	Adults	10 - 13	3
Male	Subadults	9.6	1
Male	yearling	6.58	1
Male	calf	3.5 - 6	8
Unknown	Adults	12	1
Unknown	calf	4 - 5.1	4
unknown	unknown	unknown	1