REPORT OF THE 2015 GRAY WHALE RESEARCH IN LAGUNA SAN IGNACIO AND BAHIA MAGDALENA, MÉXICO.

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INTRODUCTION

The 2015 winter at Laguna San Ignacio (LSI) was unusual in several ways. First, the water temperature ranged from 19°C to 21°C compared to 13°C to 18°C in the previous winters. This warm water was accompanied by frequent dense fog over the lagoon and thunder storms lasting up to three days that brought significant rainfall to the area. The normal prevailing North and West winds were less frequent and less severe than in previous years. Large schools of sardines and other bait fish were abundant in the lagoon, and these attracted large flocks of marine birds including pelicans, cormorants, several species of gulls, surf scoters, and terns. Species associated with warmer water, such as Brown Boobies, and Jeagers, which are not frequently seen in Laguna San Ignacio were also present in 2015. In addition, first time sightings of humpback and Bryde's whales were made near of the mouth of Bahia Magdalena.

Previous research indicated that sea water temperature influences the numbers, distribution, and durations of stay of gray whales within the breeding lagoons of Baja California (Urban et al. 1999). Overall the numbers of gray whales residing in LSI during the 2015 winter were similar to those seen during the past four winters (2010-2014), except for an unexpected large number of female-calf pairs that resided in the lagoon from mid-January to mid-February. Counts of these whales exceeded the high counts observed during the 1980's (Swartz and Jones 1984). In contrast, the lowest numbers of gray whales since 2012 were counted in Bahia Magdalens (BM), suggesting a decline in the use of that

area by gray whales in 2015. Humpback and Bryde's whales not frequently seen were also observed near of the mouth of BM.

GRAY WHALE ABUNDANCE MONITORING

Systematic surveys for gray whales have been conducted during three time periods beginning in 1977 to 1982 (Jones and Swartz 1984), 2000 to 2006 (Swartz et L. 2008), and 2007 to the present (Laguna San Ignacio Ecosystem Science Program, www.lsi-ecosystem,org).

Sixteen abundance surveys were completed in LSI to monitor the whales' seasonal abundance and use of the lagoon habitat. Surveys began on January 19 and continued until April 9 (Table 1). Surveys were conducted from an open 5m long outboard driven boat, with two observers and a third individual that recorded the observations. All surveys utilized a standardized survey methodology initially developed for LSI and implemented by Jones and Swartz (1984) and Urban et al. (2002).

In general the overall number of gray whales and their seasonal occupation of the lagoon was consistent with that seen from 2011 to 2014. Total adult whales reached their highest count 213 whales (79 single whales and 134 female-calf pairs) on February 13 (Fig.1).

An unexpected high number of female-calf pairs were observed in mid-January to mid-February and their numbers exceeded their abundance during the same months in the previous nine winters. Counts of female-calf pairs increased during January and early February, reaching a high count of 213 pairs in mid-February. Their numbers hovered around 70 to 80 pairs through March, and declined to 40 to 50 pairs by early April. (Fig. 2). Many of the calves observed in January appeared to be at least a month older than newborn calves, and perhaps they were born during the southward migration, or were coming to LSI from other areas. During this time female-calf pairs occupied the entire lagoon particularly the northern basin north of the Islands. During one Photo-ID survey,

sixteen female-calf pairs were encountered in the northernmost lagoon basin above the islands.

The abundance of single adult gray whales was greater than observed in previous winters, reaching a high count of 116 whales on February 8, after which their abundance declined with few to no singles whales observed after mid-March (Fig.3). For a second winter water temperatures ranged between 20-21^{0}C, compared to 13-18^{0}C in previous winters, which may have influenced the numbers and residence time for the whales, particularly the female-calf pairs.

In contrast to LSI, counts of gray whales in Bahia Magdalena (BM) were the lowest recorded since the 2012 winter. From 15 to 29 January and from 17 to 24 February 2015 three surveys for gray whale abundance were conducted in the BM lagoon complex (January 16 and 27, and February 19) (Fig. 4 and Table 2). The highest count of gray whales was obtained on January 27 and was of 15 individuals (two mother-calf pairs and 13 single whales), while the lowest count was 3 single whales in February 19. Mother-calf pairs were seen in only one of the three surveys. Due to the low presence of gray whales in BM, a third visit was not conducted in March. Previously the lowest survey count occurred in 2013 and was of 17 whales, which was higher than the 2015 count of 15 whales. These low counts of gray whales suggest that gray whales did not use the BM area extensively in 2015.

The sea surface temperature recorded in BM during the 2015 gray whale surveys ranged from a low of 19.5° C and a high of 23° C (mean 21.3° C), while in 2012 the temperature ranged from 16° C to 21° C (mean 18.8°C), and in 2013 from 16° C and 20° C (mean 18.1° C) respectively. Therefore, warmer sea surface temperatures in 2015 may have influenced the gray whales' use of the BM breeding and aggregation area for a shorter period of time. Continued monitoring of gray whale distribution and abundance in relation to the sea temperature in their winter aggregation areas will be necessary to understand how environmental conditions can affect in the short- and medium-term distribution patterns

of whale species. Finally, for first time, sightings of two other species of baleen whales, humpback and Bryde's whales, were made near of the mouth of Bahia Magdalena.

PHOTOGRAPHIC IDENTIFICATION, PHOTOGRAPHIC IMAGE ARCHIVING AND MANAGEMENT

Researchers from the Laguna San Ignacio Ecosystem Science Program (LSIESP) spent 348 hours over 67 days photographing gray whales in LSI. A total of 13,733 digital images were obtained from 1,145 gray whale sightings that yielded 572 individual whales. These included 277 single whales what averaged 10.1-days in the lagoon (range 1 to 68 days), and 295 females with calves that averaged 32.8-days in the lagoon (range 1 to 82 days). Digital photographs from BM were obtained from 88 sightings: 35 sightings of single whales yielding 78 individual whales; and 53 sightings of female-calf pairs yielding 69 different females with calves of the year. At least 13 mother-calf pairs and 6 single whales were sighted two or more times in BM. Final numbers of identified whales and matches with previous winter seasons will be determined during post-field season analysis during the summer of 2015 and posted on the LSIESP website (www.lsiecosystem.org).

Calving interval is a key indicator of the reproductive health of the population. Photographs of known breeding females obtained from 2006-2013 were compared to develop a revised estimate of the female calving-interval of 2.44 years (n=75). This estimated compared to an interval of 2.25 (n=60) years during the 1977-1982 time period suggests that female gray whales are not reproducing as frequently as in the previous decades.

Photographs from 2015 will be archived, placed into digital catalogs, compared with the catalogs from 2006-2014, and compared with photo ID catalogues of Laguna OLO, and LSI to determine the number and movements of gray whales that are utilizing these lagoon areas. All gray whale catalogs are posted on the LSIESP website (www.lsiecosystem.org) for review by other gray whale researchers and to facilitate searches for matches with photographs of gray whales from other portions of the species range (e.g., Pacific Northwest, Arctic, Western Pacific, etc.).

GRAY WHALE DIS-ENTANGLEMENTS

The January 2014 the Natural Resources Defense Council (NRDC) supported an IWC-SC endorsed cetacean disentanglement training workshop at LSI that provided the tools and training to safely remove fishing lines, gear, and floats from gray whales that are encountered each winter in the lagoon and elsewhere in Baja California. In 2015 three gray whale calves were discovered with lines and floats wrapped around their bodies and in their mouths. LSIESP researchers assisted by pangaros successfully removed the lines and floats from all three calves. Pangero whale-watching guides first identified gray whale calves tangled in fishing gear and floats, and radioed their sightings and positions to the LSIESP researchers who responded. Fishing gear was removed from the first calf on January 29, the second on February 12, and a third on March 9. All three calves were subsequently observed swimming normally with their mothers in the days following the disentanglements (Figs. 5a and 5b). Disentanglement training and practice is now provided to each team of LSIESP researchers.

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REFERENCES CITED

Jones, M.L. and Swartz, S.L. 1984. Demography and phenology of gray whales and evaluation of whale-watching activities in Laguna San Ignacio, Baja California Sur, Mexico. In: Jones, M.L., Swartz, S.L. and Leatherwood, S. (eds.) *The gray whale, Eschrichtius robustus*. Academic Press, Inc., Orlando, Florida, pp. 309-374

Swartz, S.L., Urbán J., Gómez-Gallardo, González S., A., Troyo, B., Nájera, M., and Rojas-Bracho, L. 2008. Preliminary Comparison of winter counts of gray whales in Laguna San Ignacio, B.C.S., Mexico from1978 to 2008. Rep. Intl. Whal. Commn. SC/60/BRG30, 19 pp.

Urbán , J.R., Gómez-Gallardo A., Flores de Sahagún, V., Palmeros M. R. and Ludwig, S. 1999. Changes in the abundance and distribution of gray whales at Laguna San Ignacio, México during the 1997-98 El Niño and the 1998-99 La Niña. SC/51/AS22, 8pp.

Urbán , J.R., Rojas-Bracho, L., Pérez-Cortéz, H., Gómez-Gallardo, A., Swartz, S., and Brownell, R.L. 2002. A review of gray whales in their wintering grounds in Mexican waters. SC/54/BRG/16.

TABLES

Table 1. Surveys of gray whales in Laguna San Ignacio during the 2015 winter breeding and calving season.

Survey	Date	Female-calf Pairs	Single	Total Adults
1	19-Jan-15	41	66	107
2	24-Jan-15	35	88	158
3	29-Jan-15	101	65	166
4	03-Feb-15	124	73	197
5	08-Feb-15	74	116	190
6	13-Feb-15	134	79	213
7	19-Feb-15	107	73	180
8	26-Feb-15	88	74	162
9	03-Mar-15	85	26	111
10	08-Mar-15	81	14	95
11	15-Mar-15	73	2	75
12	20-Mar-15	78	1	79
13	25-Mar-15	95	0	95
14	30-Mar-15	49	1	50
15	04-Apr-15	35	0	35
16	09-Apr-15	48	0	48

Table 2. Number of gray whales (Singles and Mother-calf pairs) counted during surveys in Bahía Magdalena during 2012, 2013 and in 2015.

	2012			2013			2015		
	Single	Mc	Total	Single	Mc	Total	Single	Mc	Total
Census 1	36	1	37	36	0	36	6	0	6
Census 2	36	0	36	74	0	74	13	2	15
Census 3	48	2	50	17	0	17	3	0	3
Census 4	23	5	28	25	3	28	-	-	-
Census 5	-	-	-	21	0	21	-	-	-

FIGURES

Figure. 1. Numbers of total adult whales (Adult males, females, and females with calves) counted in LSI during the seasons: 1980, and 2010-2015

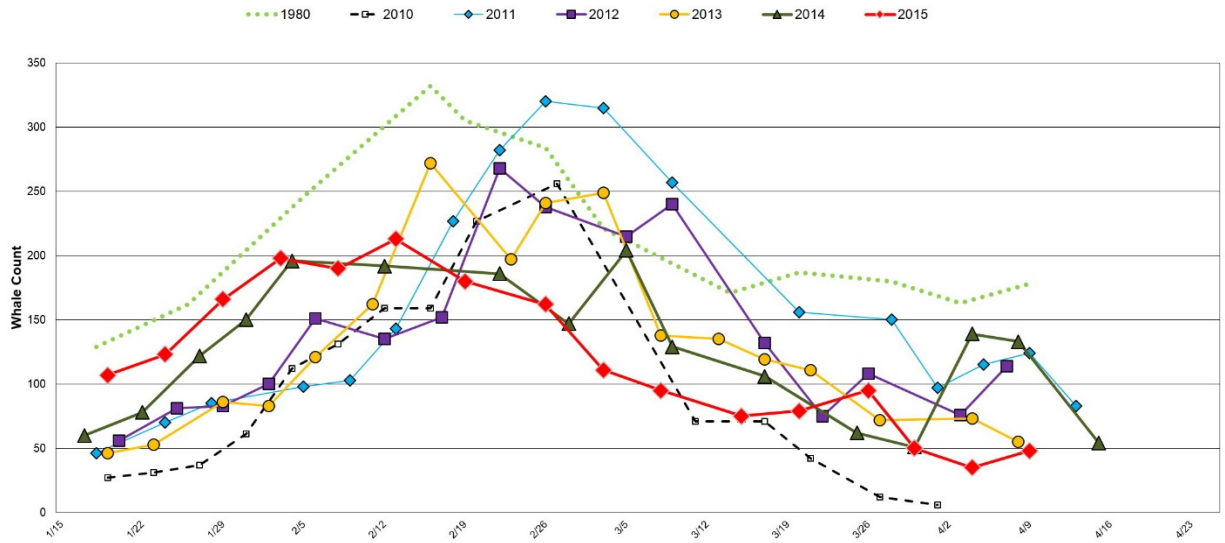

Figure. 2. Numbers of mothers-calf pairs (females with young of the years) counted in LSI during the seasons: 1980, and 2010-2015

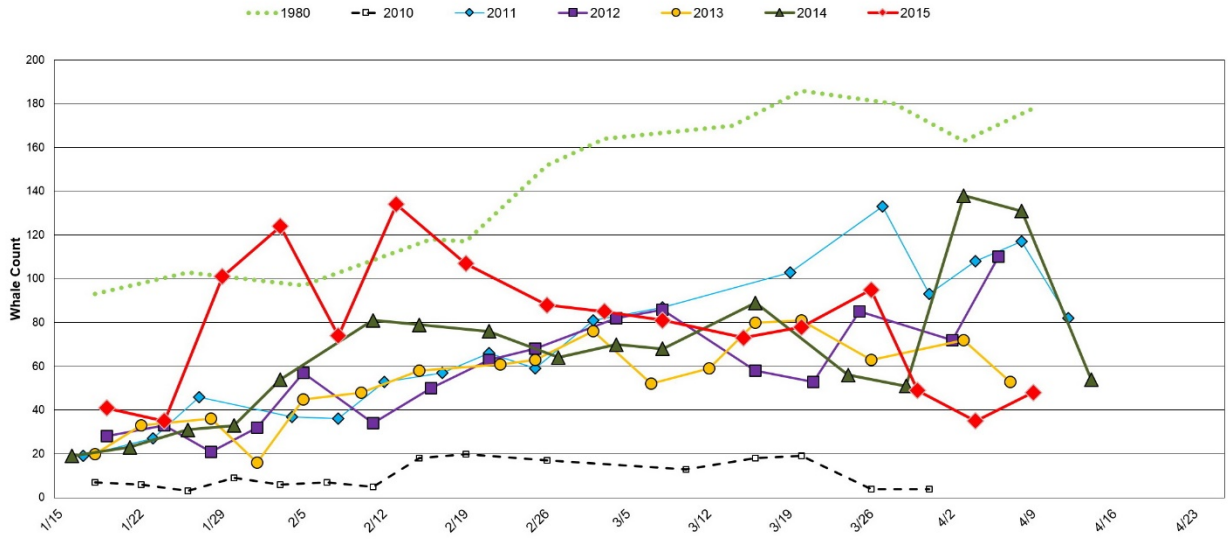

Figure. 3. Numbers of single whales (adult males and females without calves) counted in LSI during the seasons: 1980, and 2010-2015

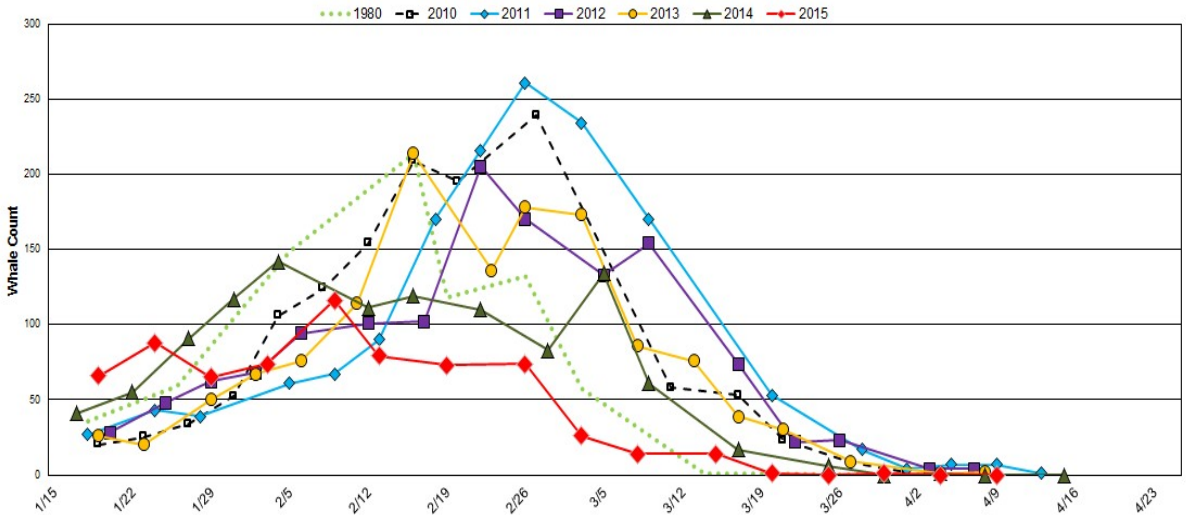

Figure 4. Whale sightings in Bahia Magdalena: red triangles are gray whale single animals; blue circles are gray whale mother-calf pairs; green squares are humpback whales; and yellow squares are Bryde's whales.

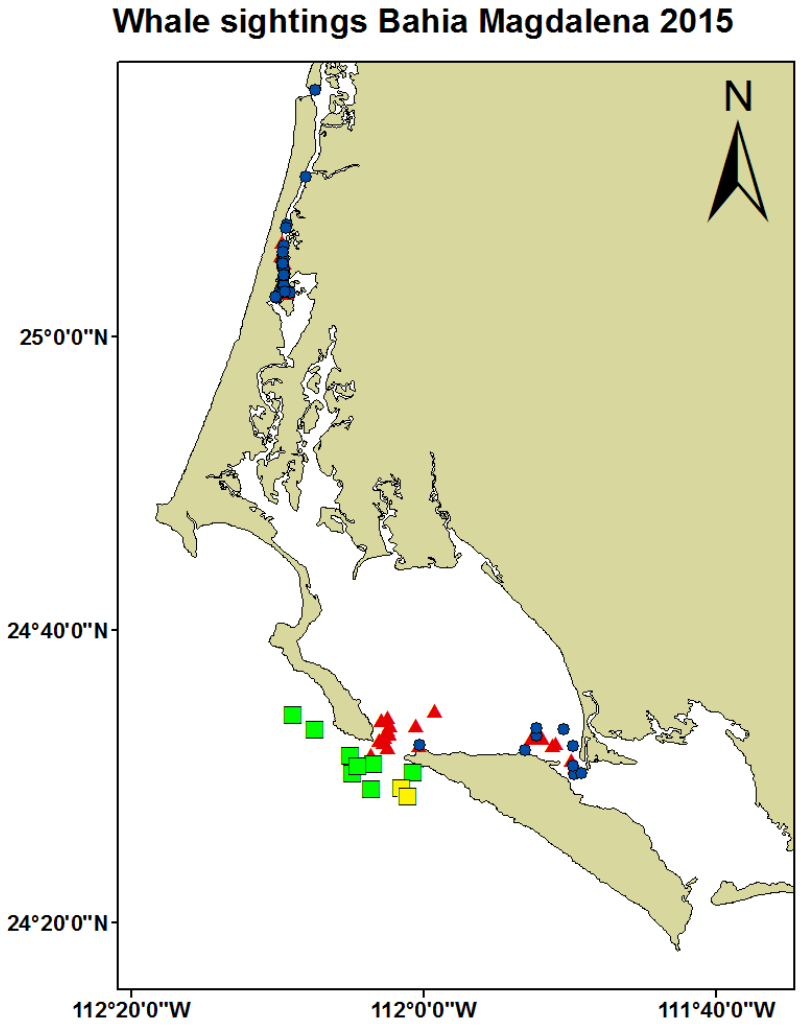

Figure 5a (left) and 5b (right). Dis-entanglement of a gray whale calf in Laguna San Ignacio on March 9th, 2015.