



Laguna San Ignacio ecosystem science program

a project of The Ocean Foundation

2014 Gray Whale Research Report

Key Findings in 2014 include:

Record numbers of gray whale mother-calf pairs enter the lagoon at end of season
Photo-ID matches confirm movements between all three Baja lagoons and Russia
Collaboration with ESSA researchers yields new data from Laguna Ojo de Liebre

Gray whale monitoring and assessment:

The 2014 Gray Whale Research Team was led by Steven Swartz from Darnestown Maryland, U.S.A., Jorge Urbán R. and Alejandro Gómez Gallardo from the Autonomous University of Baja California Sur, in La Paz, B.C.S., Mexico (UABCS). Senior field researcher Sergio Martinez A. (UABCS) served as Field Chief at the lagoon. Additional researchers included: Carlos Alberto López Montalvo (UABCS), Marina Hidalgo Reza (UNAM), Lizbeth Sanchez Eliseo (UABCS), and Ludovic Tenorio Hallé (Scripps Institution of Oceanography). The Acoustic Team included Aaron Thode and Kerri Seger (Scripps Institution of Oceanography).



Gray whale abundance monitoring involved 17 abundance surveys of gray whales in the lagoon to monitor seasonal abundance and habitat use. Surveys began on January 17, 2014 and continued until April 15, 2014. In general the overall number of gray whales and their seasonal occupation of the lagoon was consistent with that seen in 2011 to 2013, but there were a few unexpected differences in 2014 (Fig. 1). First, the abundance of single adult gray whales in January was unusually greater than in recent years, then it declined in February, only to increase to numbers similar to previous years in March and April (Fig. 2). As gray whale calves were being born, counts of mother-calf pairs increased during January and early February, after which they remained stable at around 75-80 pairs, and then declined slightly in March. Following the annual birth period, the counts of mother-calf pairs increased rapidly in April to over 138-pairs, and remained around 100 pairs as females with older moved into Laguna San Ignacio from other areas (Fig. 3). Fifty-four mother-calf pairs were counted in the lagoon during the final survey on April 15, 2014. The sudden increases, decreases, and then increase in the numbers of individuals was not expected. Also, this winter was characterized by warmer than average water temperatures that hovered between 18-20°C, compared to 14-16°C in previous winters.

The greatest number of adult whales was 204 adults counted on 5 March 2014 (134 single whales and 70 mother-calf pairs). Again this winter, the late season increase of mother-calf pairs compared to the low numbers observed 1996-2010 was significant; mother-calf counts reached a high count of 138 pairs on 4 April and remained high through the last survey on April 15th when 54 mother-calf pairs remained in the lagoon. This late season increase and photo-id records indicate that mother-calf pairs are entering Laguna San Ignacio from calving areas in BM to the south, and from OLO to the north. Counts of single whales reached a maximum of 132 whales on February 4th. Gray whales were distributed throughout the entire lagoon, resembling the distribution patterns observed during the 1978-1982 time period.

Photo-Identification, Photo Archiving and Management:

LSIESP researchers conducted 3.5-months of Photographic-Identification (Photo-ID) surveys to monitor individual whale's duration of stay in the lagoon, the number of individuals returning to the lagoon, their movements within the lagoon and among the three major lagoon-aggregation areas of Laguna San Ignacio, Laguna Ojo de Liebre, and Bahía Magdalena. Photo-ID surveys yielded photographs of approximately 450 individual single whales, and 190 mother-calf pairs (final numbers will be determined during post-season analyses). These 2014 photographs are archived, placed into digital catalogs, compared with the catalogs from 2006-2014, and posted on the LSIESP website to allow other researchers to review and search for matches with photographs of gray whales from other portions of the species range (e.g., Arctic, Western Pacific, etc.).



More than 51,000 photographs of females with calves obtained from 2006-2013 were compared by Sergio Martinez A. to estimate female gray whale calving-interval, which is a key indicator of the reproductive health of the population. From these photographs, 4,051 different individuals were identified, and of those 119 females reproduced two or more times during the study period, which represents a total of 248 reproductions (i.e., calves). Of the 129 calving intervals 49 (38%) represented births at every 2 years, 24 (19%) at 3 years, 33 (26%) at 4 years, 13 (10%) at 5 years, 8 (6%) at 6 years and 2 (2%) at 7 years. Some females were not photographed every year, and is not known if these females reproduced during these missing years. For the 79 calving intervals from 75 females with complete reproductive histories (i.e., no missing years), the average birth interval was $2.44 \pm 95\% \text{ CI } 0.13$ years, S.D. ± 0.61 , slightly greater than the interval of $2.12 \pm 95\% \text{ CI } 0.11$ years, S.D. 0.42 calculated by Jones (1990) for gray whales during the period between 1977 and 1982, but similar to the interval of $2.4 \pm 95\% \text{ CI } 0.24$ years, S.D. 0.50 calculated by Díaz (2004) for the period 1996 to 2002, and less than the $2.81 \pm 95\% \text{ CI } 0.24$ years, S.D. 0.46 calculated by Robles (2012) for the period following the range-wide die-off during 1998-2000. The majority of calving intervals (38%) estimated from the 2006-2013 data corresponds to the two-year interval, which is the normal calving interval for this species reported by other investigators (Jones 1990, Díaz 2004, Robles 2012). Intervals approaching 2-years suggest that the breeding females are obtaining sufficient nutrition to successfully reproduce each year.

At the request of the International Whaling Commission's Scientific Committee (IWC-SC), LSIESP researchers continued collaboration with other gray whale researchers to identify endangered Western gray whales that visit the gray whale breeding lagoons of Laguna San Ignacio, Laguna Ojo de Liebre, and Bahía Magdalena: to date the comparison of photographs from the breeding lagoons in Baja California have identified 23 "Western" gray whales, including breeding females, that have visited Baja California during the winter months. In 2014 LSIESP researchers made four 5-day visits to Laguna Ojo de Liebre at the invitation of Exportadora de Sal (ESSA) and the Vizcaíno Biosphere Reserve (Reserva) to collaborate on the collection of Photo-ID and biopsy data on gray whales in Laguna Ojo de Liebre. The analysis of these data is ongoing, and is conducted as part of Carlos Alberto López Montalvo's research for his Ph.D. Thesis at UABCS, in La Paz, B.C.S. Mexico. The results of his research will constitute a major contribution to the overall understanding of gray whales that winter in Baja California, and to the IWC-SC's North Pacific basin-wide research effort on gray whales.

Acoustic Research:

In 2014 winter the acoustics team of Dr. Aaron Thode and Kerri Seger of Scripps Institution of Oceanography collected three-months of digital recordings of underwater ambient noise, noise from whale-watching boats, and gray whale vocalizations to document and understand trends in naturally occurring noise in the lagoon, the vocal behavior of gray whales and their response to human and natural noise in Laguna San Ignacio. Digital recording arrays were placed at Punta Piedra (Rocky Point) in the commercial whale-watching zone to gather baseline measurements of ambient noise and whale vocal behavior. Recordings documented gray whale calls and naturally occurring biological and non-biological noise (e.g., tides, snapping shrimp, & fish), and noise resulting from the operation of whale-watching and fishing boats in the lagoon. The acoustic team is developing a report that summarizes natural, whale, and human sound in the lagoon during the period 2006 to 2013, that clearly demonstrates trends in the various sources of noise in the lagoon, and establishes a quantitative baseline for noise in the lagoon during this period and for monitoring underwater noise in the future. Kerri Seger presented a paper based on this research at the December 2013 meeting of the American Acoustical Society. The acoustics tea's report will be posted on the LSIESP website later this summer.

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Figure 1. Number of adult gray whales (males and females-calf pair) counted during the 2014 winter in Laguna San Ignacio, B.C.S., Mexico.

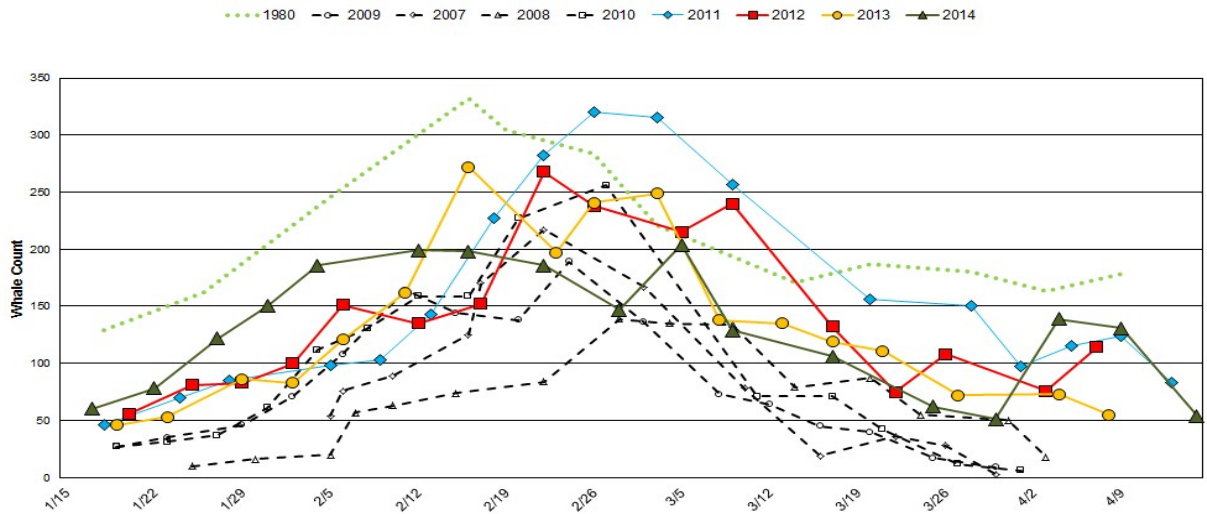


Figure 2. Number of single gray whales (adult males and females without calves) counted during the 2014 winter in Laguna San Ignacio, B.C.S., Mexico.

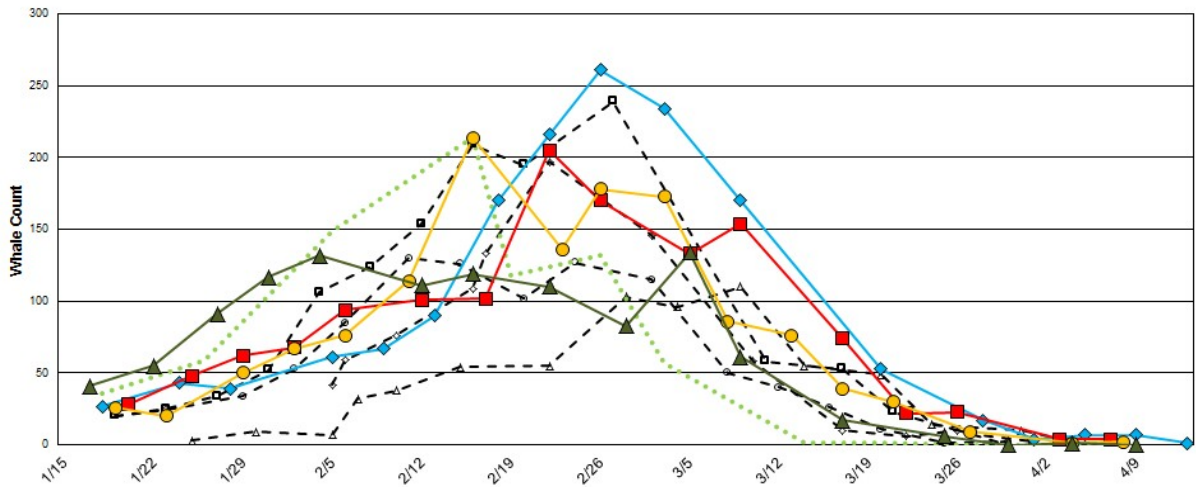


Figure 3. Number of gray whale mother-calf pairs counted during the 2014 winter in Laguna San Ignacio, B.C.S., Mexico.

