

GRAY WHALES AT BAHIA MAGDALENA LAGOON COMPLEX MEXICO, DURING WINTER 2012

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ABSTRACT

Photographic identification surveys were conducted during the 2012 winter in the Bahía Magdalena lagoon complex in Baja California Sur, México. We photographically identified 275 individual whales of which 234 were Single whales and 41 were Mother-calf pairs (Mc), of these, 83% of the Mc pair's were sighting in waters around the López Mateos area, while the majority of Singles were sighted in waters near to mouth of Bahía Magdalena (89%). Of the total number of whale's photoidentified, 91% of Single and 63% of Mc pair's, were sighted only one time. The whales with longest residence time (duration of stay) inside the lagoon complex were Mc pairs, with the longest residence time of 27 days and an average residence time for Mcs of 3.9 days. The longest residence time of a Single whale was seven days and an average residence time of 1.2 days.

KEYWORDS: GRAY WHALE, BAHÍA MAGDALENA LAGOON COMPLEX, PHOTOIDENTIFICATION, RESIDENCE TIME.

INTRODUCTION

The Bahía Magdalena lagoon complex is located on the west coast of the Baja California peninsula in Mexico (Figure 1), and is one of three winter calving-breeding lagoons and aggregation areas of the Eastern North Pacific gray whale (*Eschrichtius robustus*) that remains mostly undeveloped (Urbán *et al.*, 2003b). In Laguna San Ignacio and Laguna Ojo de Liebre there have been systematic studies and a relative constant effort during recent decades to conduct surveys to estimate abundance and surveys to obtain photographic identification data (Swartz *et al.*, 2012; Troyo, 2004; Urbán R. *et al.*, 2001; Urbán *et al.*, 2003b). However, gray whale research effort in Bahía Magdalena lagoon complex has focused almost exclusively on abundance surveys (see Urbán R. *et al.*, 2003b), without any effort on individual photo-identification.

Comparison of previous photographic identification studies revealed the mixing between Western North Pacific and Eastern North Pacific gray whales on the winter calving-breeding areas in Baja California, Mexico (Urbán R. *et al* 2012; Weller *et al.*, 2011). In addition, Jones

and Swartz (1984) used photographic identification data to demonstrate the movements of gray whales between the main winter aggregation areas in Baja California during the period 1977 to 1982. Considering that there is little recent information on the current movements and interchange between individual whales that visit the Bahía Magdalena lagoon complex and other breeding lagoons in Mexico, including intra- and inter-annually, we initiated a photographic identification research program of gray whales this lagoon complex in 2012. Objectives of this program is to understand the basic aspects of gray whales' ecology in this aggregation area, such as: the number of whales that visit this lagoon complex; the number of Mother-calf pairs (Mc), the proportion of Mc in relation to Single whales, their residence times and patterns, and inter-lagoon movements, inter alia; with the aim to elucidate similarities and/or differences with the other breeding lagoons along the Mexican Pacific coast.

METHODS

We made three visits to Bahía Magdalena lagoon complex between January and March of 2012 to obtain photographs of individual gray whales. We concentrated on photographing the visible portions of whale's backs as they surfaced to breathe, because the markings on the whales' backs provide reliable means for identification of individuals over long periods (Jones, 1990). Photographs were taken with digital SLR cameras with 70-300 mm zoom lenses. Photographs of both sides of each whale were taken whenever possible. The best photographs of each whale for each sighting were used to build an individual sighting or "recapture" history of each whale and to estimate the period of minimum residence of individual whales (i.e., the time between first and last photographic recaptures) (e.g. see Urbán R. *et al.*, 1997). Finally the highest quality photographs of each individual whale were assembled into a photographic identification catalogue of gray whales for the Bahía Magdalena lagoon complex.

RESULTS

We identified from photographs 275 different individual whales, of which 234 were Singles and 41 were Mc, which represented 85% and 15% of total sightings, respectively, for each group type (Table 1). Of the 275 adult whales, only 35 were recaptured inside the lagoon complex between January and March; 15 Mc pairs and 20 Singles (36.6% and 8.5% respectively). Mc pair's represented the longest residence times, with three whales observed inside lagoon complex for more than 20 days (i.e., 22, 23 and 27 days). The longest residence time for Single whales in the lagoon complex was 7 days (Fig. 2). The average residence time for the Mc pair's was 3.9 days compared to Singles whales that averaged 1.2 days (Table 2). Of the 41 Mc pairs identified, 34 (83%) were sighted in waters around the López Mateos Channel, while of the Singles 209 individuals (89%) were sighted in the waters around Bahía Magdalena (Fig. 1). The percent of Mc pairs identified in the Bahía Magdalena complex was lower than that documented in other winter calving-breeding lagoons in the Mexican Pacific (Table 2).

DISCUSSION.

We were able to develop a photo-identification catalogue of gray whales that visited Bahía Magdalena lagoon complex in 2012 that includes 275 individual whales. Our findings indicate that the waters of the Bahía Magdalena complex lagoon are visited principally by Single whales (85% of total individual whales photographically identified, see Table 1), and that the waters surrounding López Mateos channel are used principally by Mc pairs; (83% (34 of 41) of Mc pairs were sighted in this area and only seven were sighted in the waters of Bahía Magdalena (Fig. 1). None of Mc or Singles were sighted in both areas (BM and LM). The ratio of Mc compared to Singles animals (Mc/S) identified in lagoon complex was lower (0.18), compared to the numbers observed in Laguna San Ignacio during the period 2006-2011 (0.29), and in Laguna Ojo de Liebre during the period 2001-2003 (2.26, unpublished data; Table 2). The percent of Mc compared to Singles, considering only individual's photographed inside the López Mateos channel and inside Bahía Magdalena separately, show very different values, 1.36 and 0.03 respectively. These numbers indicate a clear difference between areas inside the lagoon complex and between classes of groups, suggesting that one area is used by single whales principally for mating activities (Bahía Magdalena), and the other area is used by Mc mainly for rearing calves (López Mateos channel). This difference in the use of the two areas was previously reported by Rice *et al* (1981) who conducted abundance surveys in this area in the 1980s.

Abundance surveys conducted in all of the wintering areas of gray whales in the Mexican Pacific in 2003 (Urbán R. *et al.*, 2003a) indicate that, of the total whales counted ~6% were located in waters of Bahía Magdalena lagoon complex. The photographic identification surveys in this study required more time to obtain individual whale photographs in the Bahía Magdalena lagoon complex (0.56 hrs/photograph) compared with Laguna San Ignacio (0.4 hours/photograph, unpublished data). This was due primarily to the lower density of whales and larger area of Bahía Magdalena complex compared to Laguna San Ignacio. The shorter residence times of whales visiting the Bahía Magdalena lagoon complex compared with the other gray whale winter calving-breeding areas indicate that gray whales spend less time in the lagoon complex of Bahía Magdalena (Table 2), suggesting a fluid dynamic of individual input-output. This suggests that individual whales are spending less time in this area because their principal activity is related with mating and not calving. These findings suggest that the photographic identification program in Bahía Magdalena lagoon complex should continue and that catalogues of the different calving-breeding areas need to be compared to contribute a better understanding of the habits of this species in Mexican waters that will contribute to their conservation.

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REFERENCES

- Jones, M.L. and Swartz, S.L. 1984. Demography and phenology of breeding gray whales in Laguna San Ignacio, Baja California Sur, Mexico: 1978 to 1982. pp. 309-374. In: Jones, M.L., S.L. Swartz, and S. Leatherwood (eds.) *The Gray Whale*. Academic Press, Inc., Orlando. 602 pp.
- Jones, M.L. 1990. The reproductive cycle in gray whales based on photographic resightings of females on the breeding grounds from 1977-82.. En: Hammond, P.S., Mizroch, S.A. y Donovan G.P. (eds) *Individual recognition of cetaceans: Use of photoidentificacion and other techniques to estimate population parameters*, pp. 177-182, Rep. Int. Whal. Commn. (Special Issue 12) U.K.440 pp.
- Rice, D. W., A. A. Wolman, D. E. Withrow, and L. A. Fleischer. 1981. *Gray Whales on the Winter Grounds in Baja California*. . Paper SC/32/PS14. 13pp Report to the International Whaling Commission, 31.

- Swartz, S.L., J. Urban .R., A. Gomez-Gallardo U., S. Martinez, T. Olavarrieta, D. Carina L., L. Rodriguez, M. Rodriguez, and L. Rojas-Bracho. 2012. Numbers of gray whales (*Eshrichtius robustus*) utilizing laguna San Ignacio, Baja California Sur, Mexico during the winter breeding seasons: 2007-2012. Report to the International Whaling Commission, SC/64/BRG14. 8pp.
- Troyo Vega, B. 2004. Permanencia y número de ballenas grises (*Eshrichtius robustus*) que visitaron la laguna Ojo de Liebre, Baja California Sur, México, en los inviernos del 2001 y 2002. Tesis Licenciatura, UABCS, México.
- Urbán R., J., A. Gómez Gallardo U. and I. Solís L. 2001. Report of the 2001 gray whale winter season in Laguna Ojo de Liebre, Mexico. Paper SC/53/BRG18 presented to the IWC Scientific Committee, July 2001, London (un published.). 8pp.
- Urbán R., J., D. Weller, O. Tyurneva, S. Swartz, A. Bradford, Y. Yakovlev, O. Ivashchenko, H. Rosales N., S. Martínez A., and A. Gómez-Gallardo U. **In press**. Report on the photographic comparison of the Western and Mexican gray whale catalogues.
- Urbán R., J., Gómez Gallardo U., L. H. Pérez-Cortéz, and L. Rojas_Bracho. 2003a. Distribución y Abundancia Relativa de la Ballena Gris en la Costa Occidental de la Península de Baja California. Informe Final INE-SEMARNAT. 53pp.
- Urbán R., J., A. Gómez-Gallardo U., V. Flores de Sahagún, L.J. Cifuentes, S. Ludwig, and R.M. Palmeros. 1997. Gray whale studies at Laguna San Ignacio, B.C.S., Mexico, winter 1996. *Rep. int. Whal. Commn*, 47:625-33
- Urbán R., J., L. Rojas_Bracho, H. Pérez-Cortéz, A. Gómez Gallardo U., S. Swartz, S. Ludwig, and R.L. Brownell Jr. 2003b. A review of gray whales on their winter grounds in Mexican waters. *J. Cetacean Res. Manage.* 5(3):281–295, 2003.
- Weller, DW, Klimek, A., Bradford, A.L., Calambokidis, J., Lang, A.R., Gisborne, B., Burdin AM, Szaniszlo, W., and Brownell RL, Jr. (2011) Movements of western gray whales from the Okhotsk Sea to the eastern North Pacific. Paper SC/63/BRG6. 5pp Submitted to the International Whaling Commission Scientific Committee. [Available from <http://www.iwcoffice.org/>].

Table 1. Number of photographically identified gray whales (Mother-calf pair and Singles) in Bahía Magdalena lagoon complex in 2012, and percent of Mc and Singles .

	Mc	Singles	Total
Individual whales	41	234	275
Percent (%)	15	85	100

Table 2. Minimum residence time (days) of gray whales that visited the winter calving-breeding lagoons in the Mexican Pacific (LSI = Laguna San Ignacio, LOL = Laguna Ojo de Liebre, BML = Bahía Magdalena lagoon complex); and percent of Mc and Singles photographically identified (%).

	Residence (days)		% Mc/Sol
	Mc	Singles	
LSI (2005-2011)	13.2	1.4	0.29
LOL (2001-2002)	3.8	1.2	2.26
BML (2012)	3.9	1.2	0.18

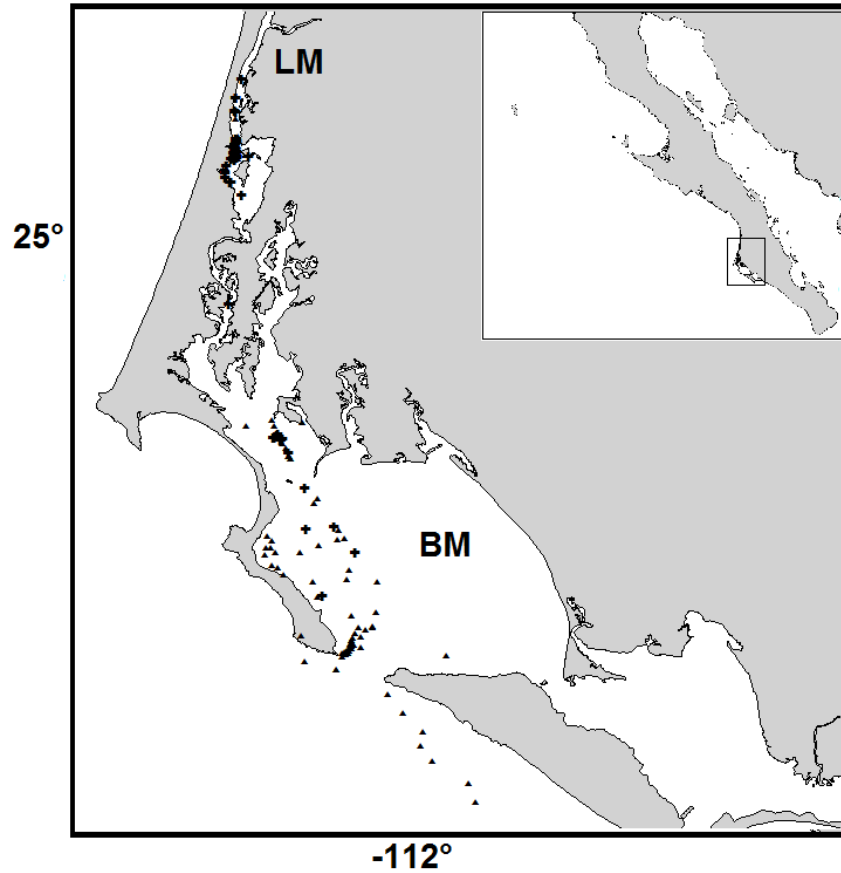


Figure 1. Bahía Magdalena lagoon complex in the west coast of the Baja California. The distribution sightings of gray whales during the winter of 2012 are shown: Mc (cross) and Singles (triangle), indicating the location of López Mateos channel (LM) and waters of Bahía Magdalena (BM).

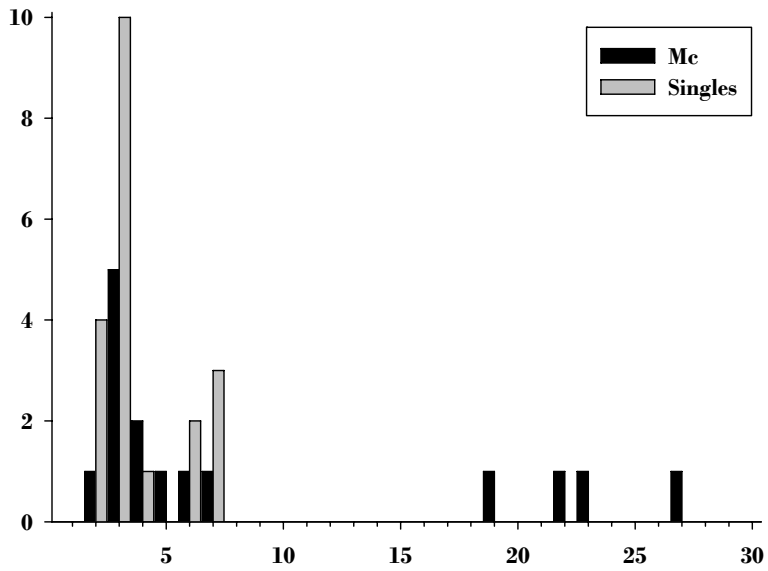


Figure 2. Number of individuals of Mc (gray) and Singles (black), with resightings, and time of minimum residence in days, during winter of 2012 in Bahía Magdalena lagoon complex.