



Research note

New records of non-resident pinnipeds from the Gulf of California, Mexico

Registros nuevos de pinnípedos no-residentes en el golfo de California, México

Juan Pablo Gallo-Reynoso^{1*}, Martín Octavio Maravilla-Chávez² and Carlos J. Navarro-Serment³

¹Laboratorio de Ecofisiología, Centro de Investigación en Alimentación y Desarrollo, A.C. Unidad Guaymas, Carretera a Varadero Nacional km 6.6, Col. Las Playitas, Guaymas, Sonora, 85480, México.

²Instituto Nacional de Ecología-SEMARNAT, Programa de Mamíferos Marinos. Ocampo 1045 Col. Centro. La Paz, Baja California Sur, 23000, México

³ONCA MAYA, A.C. Avenida de las Torres, Manzana 6, Lote 9, Región 505, Cancún, Benito Juárez, Quintana Roo, 77535, México.

*Correspondent: jpgallo@ciad.mx

Abstract. Although the California sea lion (*Zalophus californianus*) is the only pinniped resident in the Gulf of California, there are occasional records of 3 additional species; here we report 4 recent records of the Guadalupe fur seal (*Arctocephalus townsendi*), 6 of the northern elephant seal (*Mirounga angustirostris*) and 2 of the harbor seal (*Phoca vitulina*). Harbor seals have been observed mostly during the winter-spring months of El Niño years, before water temperature warms in the summer. It is possible that juveniles and subadult and adult males of *A. townsendi* and *M. angustirostris* are using the Gulf as an alternative feeding area during the season of intensive feeding as individuals disperse more and more widely as their populations grow.

Key words: Guadalupe fur seal, harbor seal, northern elephant seal, Gulf of California.

Resumen. Aunque en el golfo de California, el único pinnípedo residente es el lobo marino de California (*Zalophus californianus*), existen registros ocasionales de otras 3 especies; en la presente nota se proporcionan 4 registros recientes de lobo fino de Guadalupe (*Arctocephalus townsendi*), 6 de elefante marino del norte (*Mirounga angustirostris*) y 2 de foca común (*Phoca vitulina*). La foca común se ha observado principalmente durante los meses de invierno-primavera en años de El Niño, antes del calentamiento anual del agua en verano. Es posible que los juveniles y los machos sub-adultos y adultos tanto de *A. townsendi* como de *M. angustirostris* hagan uso del golfo como un sitio alternativo durante la temporada de alimentación intensiva como de su expansión geográfica debido a su incremento poblacional.

Palabras clave: lobo fino de Guadalupe, foca común, elefante marino del norte, golfo de California.

The California sea lion (*Zalophus californianus californianus*) is the only pinniped resident of the Gulf of California. However, 3 other species have been recorded occasionally: the Guadalupe fur seal (*Arctocephalus townsendi*) an otariid, and the 2 phocids the harbor seal (*Phoca vitulina richardsi*) and the northern elephant seal (*Mirounga angustirostris*) (Aurioles et al., 1993; Vidal et al., 1993; Mesnick et al., 1998). Here we report 12 recent new records of these 3 pinnipeds in the Gulf of California.

Guadalupe fur seal. After having been very close to extinction twice (end of the XIX century and middle of the XX century), the species has recovered well. On

Isla Guadalupe alone, Navarro and Gallo-Reynoso (2001) counted 9 827 individuals. Today there is also a reproductive colony at San Benito archipelago, with active rookeries at Isla San Benito del Este and Isla San Benito del Oeste (Maravilla-Chávez and Lowry, 1999; Esperón-Rodríguez, 2008) and a non-reproductive colony at San Miguel Island off California in the USA (Melin and DeLong, 1999). There were only 3 previous reports of the species from the Gulf of California, consisting of 1 individual seen in Guaymas, Sonora, on October 27, 1981, and 2 more on July 20, 1985, and June 26, 1986, at Los Islotes, Baja California Sur (Aurioles et al., 1993). Here we report 4 new records: a), a subadult male at Isla Lobos (also known as Islote Coloradito) on Islas Encantadas, on June 19, 1991, observed by MOMC; b), a subadult male on the north point of Isla San Pedro Nolasco on May 4,

2005; c), a subadult male seen floating on the surface in open waters ca. 5 km south of Isla San Pedro Mártir in April 9, 2006, and d), an adult male seen in open waters ca. 14 km SW of Isla San Pedro Mártir on October 16, 2009 (Fig. 1, Table 1).

Harbor seal. This species is normally found from the middle part of the Pacific coast of the Baja California peninsula, at Asunción and San Roque islands, north to the Aleutians and Pribiloff islands (Gallo-Reynoso, 2000). Occasionally some stray individuals are seen farther south along the western coast of the peninsula, from Isla Magdalena and Isla Creciente to Cabo San Lucas (Gallo-Reynoso and Aurióles, 1984; Chávez-Rosales and Gardner, 1999). However, only 2 specimens in the Gulf of California have been reported in the literature, 1 seen at Los Frailes in April 08, 1981 and a young pup found alone at Los Islotes in April 23, 1983, both in Baja California Sur (Gallo-Reynoso and Aurióles, 1984; Aurióles et al., 1993). We report 2 more records of harbor seals from the Gulf: a), on March 9, 2002, a female harbor seal pup was found entangled in fishing gear near El Mármol, Sinaloa. It was captured and sent to the Mazatlán Aquarium. The animal was wounded on its right pectoral flipper, and was missing 2 canines and a third was loose. The pup was estimated to be 1 or 2 months old, measured 80 cm total length and weighed 8.4 kg. These measurements are consistent with the reported average length of 81.6 ± 6.2 cm (Gallo-Reynoso and Aurióles, 1984) and a weight of 8-12 kg (Reeves et al., 1992) in newborn harbor seals. Because the peak of births in this species in the Mexican Pacific is in March, it is possible that this individual was recently weaned. It lived 4 years in the Mazatlán Aquarium, where she eventually died in 2006 (personal communication Tomás Ramírez and Eunice Murúa, October 2008); b), on June 13, 2004, an adult individual was observed at Isla San Pedro Mártir, located in the central Gulf region. It was resting on the rocks above the water and surrounded by juvenile and subadult California sea lions. Probably the same individual was observed again by one of us (JPGR) in the same area in March 14, 2009 (Fig. 1; Table 1). It is very important to note that these 2 records are far from the coast of the Baja California Peninsula.

Northern elephant seal. Although the species is found in the Pacific from from Navidad and Cedros islands and the San Benito Archipelago off the middle portion of the Baja California peninsula to the Aleutian Islands in Alaska (Le Boeuf and Laws, 1994), there are numerous records of individual strays in the Gulf of California. Aurióles et al. (1993) reported 1 individual seen on July 4, 1979, at Isla Ángel de la Guarda. Another was observed on June 29, 1984, at Isla Granito, off Puerto Refugio, on the northern

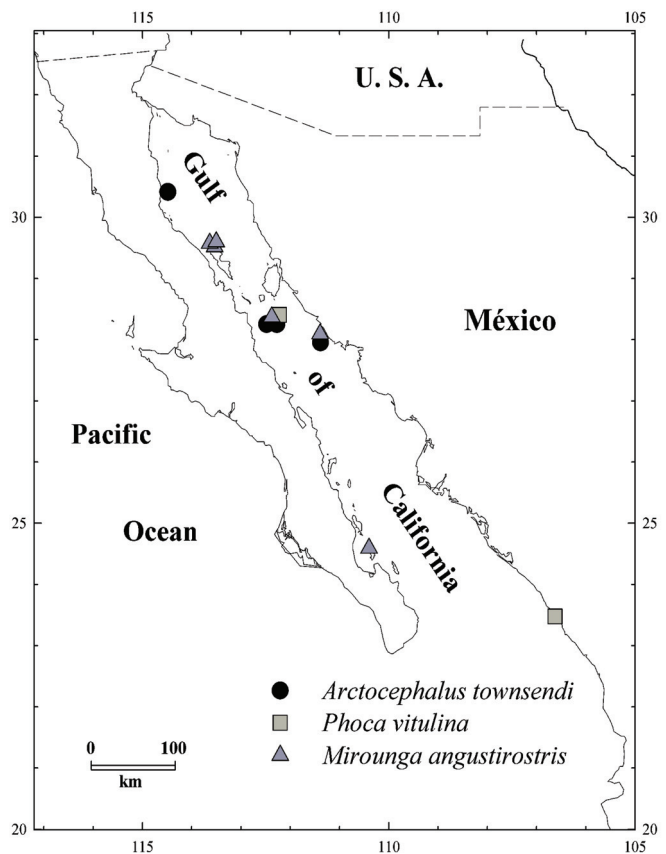


Figure 1. New pinniped records in the Gulf of California.

end of Isla Ángel de la Guarda (Aurióles et al., 1985). Finally, a 3-4 year-old female was seen at the same place on May 4, 1987 (Vidal et al., 1993). Also, 2 juveniles were reported, 1 from Bahía de los Ángeles, B. C., in August 1982 and the other from Canal de Ballenas seen in March 1986 (Vidal et al., 1993). One more juvenile and a subadult male estimated to be 6-7 years old were seen at Isla San Pedro Mártir in May of 1992 (Tershy and Breese, 1993 in Vidal et al., 1993). Mesnick et al. (1998) compiles 22 records of northern elephant seals from 10 different localities in the Gulf, including the previously described 16 juveniles, 4 subadult males, 1 adult male and 1 adult female. Here we report additional records: a), on May 23, 2005, a subadult was seen resting on the easternmost beach of Isla Granito; b), from June 24 to 26, 2005, an adult male was observed at Los Islotes, Baja California Sur; c), on May 09, 2007, we saw a subadult at Isla Granito, and several days later on the same beach as the previous record; d), 2 different subadults were seen resting next to each other. One of them had a large oval scar and tooth marks on its abdomen made by a shark, possibly a great white shark (*Carcharodon carcharias*) due to the size and

Table 1. Approximate geographic location of the new pinniped records from the Gulf of California

<i>Species</i>	<i>Locality</i>	<i>Aprox. Coordinates</i>
<i>Arctocephalus townsendi</i>		
a)	Islote Coloradito	30° 02' 48'' N, 114° 29' 02'' W
b)	Isla San Pedro Nolasco	27° 58' 55'' N, 111° 23' 13'' W
c)	Isla San Pedro Mártir	28° 18' 32'' N, 112° 16' 40'' W
d)	Isla San Pedro Mártir	28° 15' 30'' N, 112° 28' 33'' W
<i>Phoca vitulina</i>		
a)	El Mármol, Sinaloa	23° 28' 58'' N, 106° 37' 47'' W
b)	Isla San Pedro Mártir	28° 23' 18'' N, 112° 18' 00'' W
<i>Mirounga angustirostris</i>		
a)	Isla Granito	29° 33' 43'' N, 113° 32' 04'' W
b)	Isla Los Islotes	24° 35' 56'' N, 110° 24' 04'' W
c)	Isla Granito	29° 33' 43'' N, 113° 32' 04'' W
d)	Isla Granito	29° 33' 43'' N, 113° 32' 04'' W
e)	Isla San Pedro Mártir	28° 22' 38'' N, 112° 19' 03'' W
f)	Isla San Pedro Nolasco	27° 57' 34.2'' y 111° 22' 49.8''

shape of the marks; e), a female elephant seal estimated to be 3-4 years old was observed in August 20, 2008, on the southwest portion of Isla San Pedro Nolasco, near the end of the summer molt (Fig. 1; Table 1).

The recovery of pinniped species in Mexico has been successful to the point that today the northern elephant seal population has more than 125 000 individuals that breed in at least 12 different localities (both in islands and on terra firme) in Mexico and California (Stewart et al., 1994). The Guadalupe fur seal has also recovered significantly, now breeding at Isla Guadalupe and the San Benito archipelago, and a total population size estimated at close to 12 000 individuals (Gallo-Reynoso et al., 2005). The California sea lion, a species which was exploited until 1969 when its hunting was prohibited, has recovered in a short time (Lluch-Belda, 1969; Zavala and Mellink, 2000).

These recoveries seem to be independent of the oceanographic phenomena of El Niño and La Niña, which affect pinniped populations in several ways. El Niño causes mortality of pups and juveniles of the California sea lion, as was observed in California and in the San Benito archipelago during 1983. Juveniles then were very weak and emaciated, many pups were abandoned by their mothers, and many of the mothers nursed juveniles and sub-adult females instead (JPGR, personal observation). Guadalupe fur seal pups are very vulnerable during El Niño years because of a combination of rising sea level and heavy swells, which have swept them out of the rocks and into the water, causing mortalities of up to 25.3% of the pups in a breeding season, as observed during Hurricane "Darby" in July 3, 1992 (Gallo-Reynoso, 1994). During La Niña, when average water temperatures are around 3° C

colder than normal, pinnipeds travel farther south than their normal foraging grounds along the California current. During La Niña the water temperature is also colder inside the Gulf, and the isotherm is shallower than normal in both areas (Lavin and Marinone, 2003; Lavaniegos et al., 2003), which translates into more accessibility to food for them in the water column, thus having a larger area to disperse and forage.

Regarding the harbor seal, there is a scarcity of information about its incidental mortality, although there are some records in the 1980s of their use as bait for longline shark fishing in the Mexican Pacific. Their current total population size in Mexico is estimated to range between 1 000 (Gallo-Reynoso and Aurióles, 1984), 1 700 (Padilla, 1990), and 1 165 individuals (MOMC 1995, unpublished data).

The presence of these 3 pinniped species in the Gulf may be explained by a combination of factors, including the fact that 2 of them, the elephant seal and the Guadalupe fur seal, are species whose individuals travel very long distances between their feeding and breeding grounds. The northern elephant seal makes 2 annual migrations from its breeding grounds in Mexico (Isla Guadalupe, San Benito archipelago and Isla Cedros) to the Gulf of Alaska, returning during spring to molt and during winter to give birth and mate. Some subadult and some adult males have been fitted with satellite tags at San Benito archipelago, and their migratory movements have been tracked. Subadults moved south to Almejas Bay (Baja California Sur) area, whereas adult males made the predicted trip north to the Gulf of Alaska. None of the tracked subadults were observed in the Gulf of California (Robinson et al., 2005),

but the proof of their traveling south to a zone with similar characteristics as the Gulf of California, together with the 22 records reported by Mesnick et al. (1998) and the ones that we present here, make us think that their presence in the Gulf is not fortuitous.

Probably the Gulf is an alternative feeding ground and molting area for the species, as opposed to the proposal by Mesnick et al. (1998) that the Gulf might become a new breeding ground for the species. Also contrary to this idea is the fact that the average air temperatures on the beaches with the best characteristics for breeding (*i.e.* Granito and Ángel de la Guarda islands), are 5° C warmer than the average in the San Benito archipelago during winter, which together with Isla Natividad are the northern elephant seal's warmest breeding grounds in the Pacific. Although winter water temperatures are similar in both areas, the higher air temperatures would mean a higher energetic cost due to thermoregulatory stress while on the beach on warmer days (McGinnis and Southworth, 1971). Finally, the long distance and time to reach traditional feeding areas of both males and females in the Gulf of Alaska (Le Boeuf and Crocker, 2005), the delay in trip days (shortening the breeding season), and the high energetic cost of such a trip (approximately 4 000 km or more, multiplied by 2 annual round trips) would not allow the establishment of a reproductive colony in the Gulf of California.

As we have argued for the northern elephant seal, the warm Gulf temperatures also make the establishment of a breeding colony of Guadalupe fur seals unlikely. Instead, it seems that as their populations rebound they are more frequent visitors to the Gulf during periods of active feeding. Water temperatures inside the Gulf are up to 10 °C warmer than in the Pacific at the latitude of Isla Guadalupe (29° N). Moreover, fur seals have a fat layer and 2 hair layers (the short, dense layer traps air and provides waterproof insulation, whereas the longer, less dense layer protects them against the sun) which gives them extra insulation in temperate waters. These adaptations for cold tolerance would not allow them to establish a breeding colony inside the Gulf due to the probable higher energetic cost of thermoregulation. Guadalupe fur seals at Isla Guadalupe during the breeding season occupy areas with access to shade, spray, and pools, where they are able to cool off. Surface sea water at Guadalupe fur seal breeding grounds had a mean temperature of 19.7° C (Gallo-Reynoso, 1994), while in the Gulf during the same months the water around the San Pedro Nolasco rookery of California sea lions had a mean of 29.4° C (n= 19, range: 26 – 31° C, measured during 6 breeding seasons), nearly 10° C more than at the Pacific rookeries. We believe that the presence of Guadalupe fur seals in the Gulf is a result of the geographic expansion of the species due to their population growth,

and accounts for their appearance during the season of intensive feeding, particularly young males and subadults. Adult males have never been observed in their summer breeding season in the Gulf. This observation supports the idea that Guadalupe fur seal reproduction takes place only in the rookeries of the Pacific islands, as is the case today in the San Benito islands where the species is using former California sea lion territories.

Harbor seals have been reported far from their breeding grounds mostly during the winter-spring months of 3 El Niño years: 1982-1983 (Gallo-Reynoso and Aurióles, 1984), 1997-1998 (Chávez-Rosales and Gardner, 1999) and 2001-2002 (in this paper), including at least 2 births inside the Gulf (Gallo-Reynoso and Aurióles, 1984, and this paper), recorded before water temperature started to warm during summer due to the influx of tropical Pacific water masses (Lavín and Marinone, 2003). The above may suggest a rare use of the Gulf, since the gravid females that traveled to Los Islotes and El Mármol on the mainland coast of México from at least their southernmost distribution at Isla San Roque in the Pacific swam approximately 550 and 600 km, and at least 880 km were traveled by the individual seen at Isla San Pedro Mártir. These distances and differences in mean water temperatures might represent an important limiting factor to the expansion of the species' range to the south.

We specially thank E. Murúa of CIAD-Mazatlán and T. Ramírez of Acuario de Mazatlán for their information on the harbor seal held at the Mazatlán Aquarium. CJNS and MOMC would like to thank Lindblad Expeditions, from whose ships several of the observations reported here were made.

Literature cited

- Aurióles-Gamboa, D., F. Sinsal, B. J. Le Boeuf and L. T. Findley. 1985. Pinnípedos registrados fuera de su rango de distribución en México. Resúmenes X Reunión Internacional para el Estudio de los Mamíferos Marinos. La Paz, Baja California Sur.
- Aurióles-Gamboa, D., B. J. Le Boeuf and L. T. Findley. 1993. Registros de pinnípedos poco comunes para el Golfo de California. Revista Investigación Científica, UABCS. 1 (No. Especial SOMEMMA 1):13-19.
- Chávez-Rosales, S. and S. C. Gardner. 1999. Recent harbour seal (*Phoca vitulina richardsi*) pup sightings in Magdalena Bay, Baja California Sur, Mexico. Aquatic Mammals 25:169-171.
- Esperón-Rodríguez, M. 2008. Estado actual del lobo fino de Guadalupe (*Arctocephalus townsendi* Merriam, 1897) en el Archipiélago de San Benito, Baja California: tamaño de la población, biología reproductiva y alimentación. Master Thesis (Science). Instituto de Ciencias del Mar y Limnología.

- UNAM. 59 p.
- Gallo-Reynoso, J. P. and D. Aurióles-Gamboa. 1984. Distribución y estado actual de la población de la foca común (*Phoca vitulina richardsi* Gray, 1864) en la península de Baja California, México. *Anales del Instituto de Biología, UNAM. Serie Zoología* 55:323-332.
- Gallo-Reynoso, J. P. 1994. Factors affecting the population status of Guadalupe fur seal, *Arctocephalus townsendi* (Merriam, 1897), at Isla de Guadalupe, Baja California, México. Ph. D. Dissertation, University of California Santa Cruz. 199 p.
- Gallo-Reynoso, J. P. 2000. Familia Phocidae. In *Mamíferos del Noroeste de México II*, S. T. Álvarez-Castañeda and J. L. Patton (eds.). CIBNOR, La Paz, B.C.S. p. 781-787.
- Gallo-Reynoso, J. P., B. J. Le Boeuf, A. L. Figueroa-Carranza and M. O. Maravilla-Chávez. 2005. Los pinnípedos de Isla Guadalupe. In *Isla Guadalupe, Restauración y Conservación*, K. Santos del Prado and E. Peters (eds.). Instituto Nacional de Ecología. México. p. 170-201.
- Gallo-Reynoso, J. P., A. L. Figueroa and B. J. Le Boeuf. 2008. Foraging behavior of lactating Guadalupe fur seal females. In *Avances en el Estudio de los Mamíferos de México*, C. Lorenzo, E. Espinoza and J. Ortega (eds.). Publicaciones Especiales, Vol. II, Asociación Mexicana de Mastozoología, A. C., México. p. 595-614.
- Lavaniegos, B. E., G. Gaxiola-Castro, L. C. Jiménez-Pérez, M. R. González-Esparza, T. Baumgartner and J. García-Córdova. 2003. 1997-98 El Niño effects on the pelagic ecosystem of the California current off Baja California, Mexico. *Geofísica Internacional* 42:483-494.
- Lavín, M. F. and S. G. Marinone. 2003. An overview of the physical oceanography of the Gulf of California. In *Nonlinear processes in geophysical fluid dynamics*, O. U. Velasco Fuentes, J. Sheinbaum and J. L. Ochoa de la Torre (eds.). Kluwer Academic Publishers. The Netherlands. p. 173-204.
- Le Boeuf, B. J. and R. M. Laws. 1994. Elephant seals: An introduction to the genus. In *Elephant seals, population ecology, behavior and physiology*, B. J. Le Boeuf and R. M. Laws (eds.). University of California Press, Los Angeles. p. 1-28.
- Le Boeuf, B. J. and D. E. Crocker. 2005. Ocean climate and seal condition. *BMC Biology* 3 :9 <http://www.biomedcentral.com/1741-7007/3/9>, 01.09.2009.
- Lluch-Belda, D. 1969. El lobo marino de California *Zalophus californianus californianus* (Lesson 1828) Allen, 1880. Observaciones sobre su ecología y explotación. Instituto Mexicano de Recursos Naturales Renovables, A.C. México, D. F. p. 1-71.
- Maravilla-Chávez, M. O. and M. S. Lowry. 1999. Incipient breeding colony of Guadalupe fur seals at Isla Benito del Este, Baja California, Mexico. *Marine Mammal Science* 15:239-241.
- McGinnis, S. M. and T. P. Southworth. 1971. Thermoregulation in the northern elephant seal, *Mirounga angustirostris*. *Comparative Biochemistry and Physiology* 40:893-901.
- Melin, S. R. and R. L. DeLong. 1999. Observations of a Guadalupe fur seal (*Arctocephalus townsendi*) female and pup at San Miguel Island, California. *Marine Mammal Science* 15:885-888.
- Mesnick, S. L., M. C. García-Rivas and B. J. Le Boeuf. 1998. Northern elephant seals in the Gulf of California, Mexico. *Marine Mammals Science* 14:171-177.
- Navarro-Serment, C. J. and J. P. Gallo-Reynoso. 2001. El regreso del lobo fino de Guadalupe. Una población en ascenso. *National Geographic en Español. Sección Geográfica*. Junio 2001. 8.
- Padilla, V. A. M. 1990. Aspectos biológicos de la foca común (*Phoca vitulina richardsi* Gray, 1864) en la costa occidental de Baja California. (Carnívora:Phocidae). Thesis, Facultad de Ciencias, Universidad Nacional Autónoma de México. 88 p.
- Reeves, R. R., B. S. Stewart and S. Leatherwood. 1992. The Sierra Club handbook of seals and sirenians. Sierra Club Books, San Francisco. 359 p.
- Robinson, P. W., D. P. Costa, D. E. Crocker, J. P. Gallo-Reynoso and M. C. García-Aguilar. 2006. At-sea behavior of northern elephant seals (*Mirounga angustirostris*) at San Benito Islands. Resúmenes Primera Reunión Internacional Sobre el Estudio de Mamíferos Acuáticos. SOMEMMA-SOLAMAC. Mérida, Yucatán. 5 - 9, noviembre.
- Stewart, B. S., P. K. Yochem, B. J. Le Boeuf, H. R. Huber, R. L. DeLong, R. Jameson, W. Sydeman and S. G. Allen. 1994. History and present status of the northern elephant seal population. In *Elephant seals: population ecology, behavior, and physiology*, B. J. Le Boeuf and R. M. Laws (eds.). University of California Press, Los Angeles. p. 29-48.
- Vidal, O., L. T. Findley and S. Leatherwood. 1993. Annotated checklist of the marine mammals of the Gulf of California. *Proceedings of the San Diego Society of Natural History*. San Diego, California. No. 28. 17 p.
- Zavala-González, A. and E. Mellink. 2000. Historical Exploitation of the California Sea Lion, *Zalophus californianus*, in México. *Marine Fisheries Review* 62:35-40.