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Short Note

First Extralimital Record of an Eastern Pacific Harbor Seal (*Phoca vitulina richardii*) Pup at Guadalupe Island, Mexico

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The Eastern Pacific harbor seal (*Phoca vitulina richardii*; hereafter "harbor seal") is a coastal phocid subspecies found along the west coast of North America, from the Aleutian Islands, Alaska, USA, to central Baja California, Mexico (Rice, 1998; Jefferson et al., 2015). The vast majority of the harbor seal population is found north of Mexico and is estimated at approximately 370,000 individuals (Bjorge et al., 2010). The population of harbor seals in Mexico is estimated to be approximately 5,000, and information regarding the abundance and distribution of these animals was lacking until recently (Lubinsky-Jinich et al., 2017). There are established rookeries for this subspecies at nine Mexican islands: Coronado, Todos Santos, San Martín, San Jerónimo, San Benito, Cedros, Natividad, San Roque, and Asunción (Figure 1). Around this latitude, the breeding season of the harbor seal is from mid-February to mid-April (Fernández-Martín, 2012). Harbor seals typically forage in coastal continental shelf waters, bays, and estuaries (Burns, 2009). In Mexican waters, harbor seals primarily feed on benthic fishes and cephalopods (Elorriaga-Verplancken et al., 2013, 2016; Durazo et al., 2015), and they primarily forage around islands that are 1.6 km (Asunción) to 70 km (San Benito Archipelago) offshore of the mainland Baja California coast (Lubinsky-Jinich et al., 2017).

On 15 April 2017, a small harbor seal (Figure 2) was sighted at the southern portion ("Punta Sur," 29° 01' N, 118° 16' W) of Guadalupe Island Biosphere Reserve. Guadalupe Island is an oceanic island approximately 255 km offshore of the west coast of Baja California, where the nearest known harbor seal colony is located, and 170 km offshore of the continental shelf break. Three other pinniped species breed on this island: the Guadalupe fur seal (*Arctocephalus philippii townsendi*), the northern elephant seal (*Mirounga angustirostris*), and the California sea lion (*Zalophus californianus*).

The animal appeared in good body condition and was estimated to be ~70 cm in length. We inferred that the individual was approximately 4 wks of age based on visual assessment at the time of sighting and age-length relationship for other young harbor seals (Gallo-Reynoso & Aurioles-Gamboa, 1984; Chávez-Rosales & Gardner, 1999; Greig, 2011). The pup's weaning status was unknown, but no other harbor seal was seen in the area or surrounding waters. Adult female harbor seals undertake regular foraging trips of 7.1 h on average and around 45 km from shore during the lactation period, which lasts 24 to 31 d (Boness et al., 1994). Thus, the mother may have been at sea when the pup was sighted. Due to the timing of the sighting at the end of the breeding season, the size and probable age of the pup, and the significant distance between Guadalupe Island and known harbor seal rookeries, we believe that the pup was recently weaned and likely was born on Guadalupe Island. However, because recently weaned harbor seals can rapidly disperse great distances of 75 km or more (Small et al., 2005; Greig, 2011), we cannot completely discard the possibility that the pup was born at an established Mexican harbor seal rookery.

We were engaged in other activities on the island when the pup was sighted. We withdrew quietly from the area and decided not to handle the animal for measurements to minimize the odds of it retreating to the water or its mother abandoning it in case it was not yet weaned. Instead, we

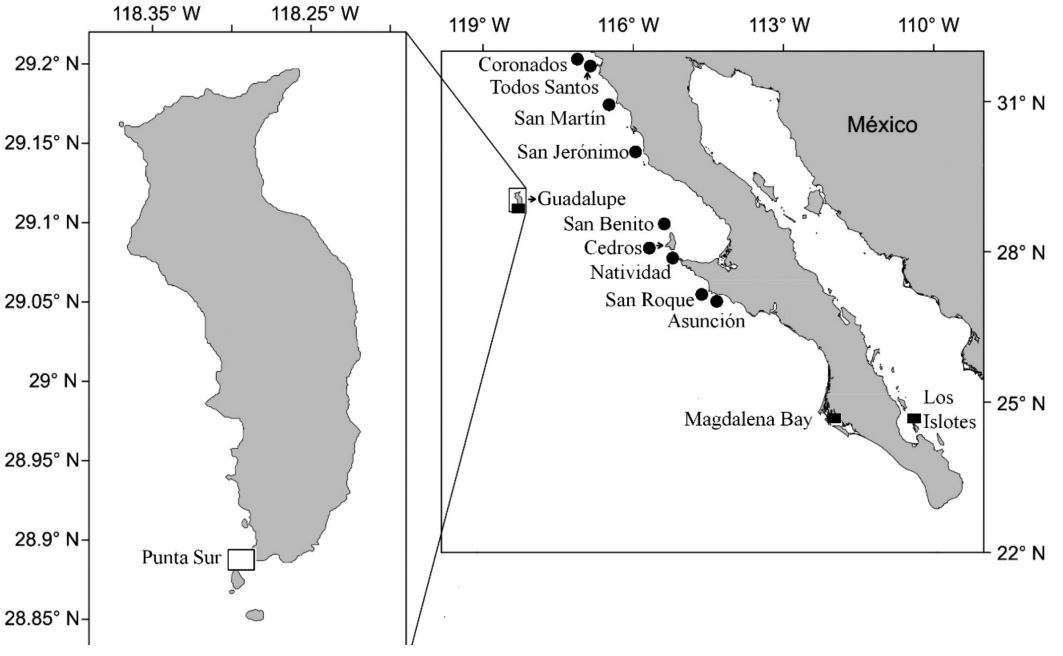

Figure 1. Distribution of the Eastern Pacific harbor seal (*Phoca vitulina richardii*) along the west coast of Baja California, Mexico. Our sighting of a harbor seal pup occurred at Punta Sur (white square), Guadalupe Island (left panel). Black squares indicate previous rare pup sightings by Gallo-Reynoso & Aurioles-Gamboa (1984) at Los Islotes Island in the Gulf of California and by Chávez-Rosales & Gardner (1999) in Magdalena Bay.

took photographs to document the seal's presence on the island and obtained approximate measurements. We visited the beach on five subsequent days but neither the pup nor other harbor seals were seen again.

There have been previous reports of harbor seal pups sighted at unprecedented Mexican sites without their mothers: one pup was sighted (23 April 1983) at Los Islotes Island in the southern Gulf of California, and two pups were seen in Magdalena Bay (3, 7, and 21 April 1998; Gallo-Reynoso & Aurioles-Gamboa, 1984; Chávez-Rosales & Gardner, 1999; Figure 1). These latter sightings represent the southernmost records of pup occurrence for this subspecies. Our sighting represents the farthest west record in Mexico (Figure 1).

Warm-water anomalies (e.g., El Niño-Southern Oscillation [ENSO]) have been related to unusual dispersal events and extralimital records for many pinniped species because their prey communities are dispersed and disrupted (e.g., Trillmich & Ono, 1991; Crocker et al., 2006; Weise et al., 2006; Alava & Aurioles-Gamboa, 2017). The previous unusual harbor seal pup sightings at Los Islotes Island and Magdalena Bay occurred during strong ENSO events in 1982-1983 (Gallo-Reynoso & Aurioles-Gamboa, 1984) and 1997-1998 (Chávez-Rosales & Gardner, 1999), when changes in prey availability had an important impact on other pinnipeds such as the California sea lion (Aurioles-Gamboa & Le Boeuf, 1991). However, ENSO neutral conditions were present in spring 2017, and sea surface temperatures (SST) in the eastern Pacific Ocean were not unusually warm (e.g., mean Oceanic Niño Index – 3.4 Region = 0.02; www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.shtml). Therefore, warmer ocean conditions may not have been the primary factor contributing to this unusual sighting. However, we cannot rule out the potentiality of time-lagged effects from the anomalous events that occurred during 2014 to 2016 in the northeastern Pacific Ocean (e.g., North Pacific marine heat wave [formally termed "the Blob" by Bond et al., 2015] of 2014-2015 [Di Lorenzo & Mantua, 2016] and the ENSO of 2015-2016). Time-lagged ocean climate effects have been observed to affect foraging behaviors and condition of pinnipeds (Trillmich & Ono, 1991; Sydeman & Allen, 1999; Le Boeuf & Crocker, 2005). These effects may have influenced the distribution of harbor seals or their prey prior to conditions they experienced in spring 2017.

Our observation of a harbor seal pup at Guadalupe Island is a unique record because the typical distribution of this species is in shallow coastal

Figure 2. Eastern Pacific harbor seal pup recorded at Punta Sur, Guadalupe Island, Baja California, Mexico (*Photo credit:* A. C. Deming)

areas where they feed on benthic prey (Elorriaga-Verplancken et al., 2013; Durazo et al., 2015). Another pinniped with a primarily coastal distribution, the California sea lion (Lowry et al., 1990; García-Rodríguez & Aurioles-Gamboa, 2004), resides and breeds on Guadalupe Island. However, there is little shallow-water benthic habitat around Guadalupe Island, and California sea lions and the other two pinniped species that currently breed on Guadalupe Island primarily forage on non-benthic prey throughout most of their range (Lowry et al., 1990, 1991; Le Boeuf et al., 2000; Weise & Harvey, 2008; Orr et al., 2011; Gallo-Reynoso & Esperón-Rodríguez, 2013). Exponential increases of harbor seal populations have recently been reported along the northeastern Pacific Ocean (Jeffries et al., 2003; Brown et al., 2005; Department of Fisheries & Ocean [DFO], 2010), which may well contribute to the expansion and dispersal to and into other regions along and off the west coast of North America (Alava & Aurioles-Gamboa, 2017). Changes in ocean conditions with increases in primary productivity in the northeastern Pacific Ocean could also favor the increases of this species in the region of the Pacific (Brown et al., 2005). Furthermore, it is known that some populations of seals from the Northern Hemisphere are currently expanding their range and spreading to new localities where they have not been recorded in the past (Alava & Carvajal, 2005; Alava & Aurioles-Gamboa, 2017).

If it is possible for a pinniped species typically associated with benthic coastal foraging to inhabit this oceanic island, it opens the possibility of future sightings of harbor seals on Guadalupe Island, especially considering that the harbor seal population is increasing throughout its range (Bjorge et al., 2010), including within Mexican waters (Lubinsky-Jinich et al., 2017). Our sighting provides the first report of a harbor seal on Guadalupe Island, which is the westernmost occurrence in Mexican waters. With the increasing population trend for this subspecies, it is vital that we increase monitoring in areas not typically inhabited by harbor seals because potential colonization at new sites may need to be considered for conservation and management issues—both for the species and areas where they are found.

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