



Latin American Journal of Aquatic
Research

E-ISSN: 0718-560X

lajar@pucv.cl

Pontificia Universidad Católica de
Valparaíso
Chile

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Marcelo

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Latin American Journal of Aquatic Research, vol. 42, núm. 4, octubre, 2014, pp. 743-751
Pontificia Universidad Católica de Valparaíso
Valparaíso, Chile

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Review

Marine mammals of Easter Island (Rapa Nui) and Salas y Gómez Island (Motu Motiro Hiva), Chile: a review and new records

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ABSTRACT. The Chilean oceanic islands Easter Island (Rapa Nui) and Salas y Gómez Island (Motu Motiro Hiva) have received little attention with regards to basic marine mammal investigations. Here we review and update available information on the status of marine mammals in this area from different sources, including published accounts, local interviews and two recent expeditions. We also provide detailed accounts for each confirmed family or species, including historical data from published archaeological studies and whalers' logbooks from the 18th to the 20th centuries. Results indicate that a total of five marine mammal families (Balaenopteridae, Physeteridae, Ziphiidae, Delphinidae and Phocidae) have been confirmed within the study area, representing two mammalian orders (Cetartiodactyla and Carnivora). Within these, twelve species are known to occur: blue whale (*Balaenoptera musculus*), unidentified minke whale (*Balaenoptera bonaerensis* or *B. acutorostrata*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), Cuvier's beaked whale (*Ziphius cavirostris*), Blainville's beaked whale (*Mesoplodon densirostris*), false killer whale (*Pseudorca crassidens*), unidentified pilot whale (*Globicephala* sp.), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus* sp.), southern elephant seal (*Mirounga leonina*) and leopard seal (*Hydrurga leptonyx*). We discuss the implications of some of most noteworthy records and make a plea for further studies to improve our knowledge of these top predators in one of the most isolated places in the world.

Keywords: cetacean, pinniped, oceanic islands, Nazca ridge, southeastern Pacific.

Mamíferos marinos de la Isla de Pascua (Rapa Nui) e Isla Salas y Gómez (Motu Motiro Hiva), Chile: una revisión y nuevos registros

RESUMEN. Las islas oceánicas chilenas Isla de Pascua (Rapa Nui) e Isla Salas y Gómez (Motu Motiro Hiva) han recibido mínima atención en relación con la determinación de la riqueza de especies de mamíferos marinos, su distribución y aspectos básicos de su ecología. En este trabajo nos propusimos realizar una revisión de la información disponible y actualizar registros previos utilizando diferentes fuentes, incluyendo entrevistas locales, antecedentes arqueológicos y bitácoras de balleneros de los siglos XVIII-XX, junto con dos campañas de terreno realizadas recientemente. Los resultados indican que un total de cinco familias de mamíferos marinos (Balaenopteridae, Physeteridae, Ziphiidae, Delphinidae y Phocidae) proviniendo de dos órdenes (Cetartiodactyla y Carnivora) están representadas en el área de estudio. Entre los cetáceos, diez especies se encuentran confirmadas: ballenas azul (*Balaenoptera musculus*), ballena minke Antártica enana (*Balaenoptera bonaerensis/acutorostrata*), ballena jorobada (*Megaptera novaeangliae*), cachalote (*Physeter macrocephalus*), zifio de Cuvier (*Ziphius cavirostris*) y mesoplodonte de Blainville (*Mesoplodon densirostris*), orca falsa (*Pseudorca crassidens*), calderón de aletas cortas (*Globicephala macrorhynchus*), tursión (*Tursiops truncatus*), delfín común de rostro corto (*Delphinus delphis*), y en Carnivora, dos especies de fócidos: el elefante marino del sur (*Mirounga leonina*) y la foca leopardo (*Hydrurga leptonyx*). Se discuten las implicancias de algunos de los registros más relevantes y se enfatiza la necesidad de desarrollar investigaciones sistemáticas con el fin de

incrementar el básico conocimiento que se dispone sobre estos depredadores, en una de las zonas más remotas de la Tierra.

Palabras clave: cetáceo, Pinnipedia, islas oceánicas, cordillera submarina de Nazca, Pacífico suroriental.

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INTRODUCTION

Modern knowledge available in Chile on marine mammal distribution and species richness is mostly accessible through the numerous publications since 1946. These primarily correspond to records obtained in waters adjacent to the continental coast (<60 km offshore), with only a few noteworthy exceptions (*e.g.*, Clarke, 1962; Aguayo *et al.*, 1998a). Chilean oceanic islands have received little attention and thus availability of reports appraised by specialists and/or published in peer-reviewed literature are scarce.

The only systematic research on marine mammals performed to date in the waters lying off Easter Island (Rapa Nui) and Salas y Gómez Island (Motu Motiro Hiva) (*ca.* 3,700 km from mainland) was reported by Aguayo *et al.* (1998a), and included five cruises from Valparaíso to Easter Island during September 1993, May and September 1994, and June and September 1995. Here, we review and update previous information and report new records regarding marine mammals in the study area.

MATERIALS AND METHODS

The study area includes the waters off Easter Island (27°09'S, 109°26'W) and Salas y Gómez Island (26°27'S, 105°28'W), two Chilean-Polynesian islands located in the southeastern Pacific Ocean some 3,700 and 3,300 km (respectively) west of the mainland, as well as the corresponding Exclusive Economic Zones that encompass a total of 634,460 km². This paper includes a bibliographic review of reports available in the Library of the Faculty of Marine Sciences and Natural Resources of the University of Valparaíso, the 'William Mulloy' Library of the 'Father Sebastian Englert' Anthropological Museum at Easter Island, Townsend's charts (1935) depicting whalers' log-books from 1761-1920, local newspapers, private libraries of national marine mammal researchers, as well as the archives of the Provincial Office of the Corporación Nacional Forestal (CONAF) of Easter Island. Additionally, we visited Easter Island on November 2012 (R. Huckle-Gaete (RHG) & M. Flores (MFM)) and September 2013 (MFM & S. Yancovic (SY)) including in this latter trip a visit to Salas y Gómez

Island. We interviewed islanders and CONAF rangers, and also reviewed photographs and the osteological collection in the island's museum.

RESULTS AND DISCUSSION

Available information to date indicates that two marine mammal orders are present in the study area, Cetartiodactyla and Carnivora, among which a total of five families and twelve species have been confirmed (Table 1).

Order Cetartiodactyla

Family Balaenopteridae: Only three species belonging to this family (commonly referred to as rorquals) have been reported in the study area, namely: the blue whale (*Balaenoptera musculus*), the Antarctic minke whale (*Balaenoptera bonaerensis*) and the humpback whale (*Megaptera novaeangliae*) (Townsend, 1935; Aguayo *et al.*, 1998a).

Blue whale: While inspecting the collection held at the Father Sebastian Englert Museum on Easter Island, we discovered a previously unreported blue whale record, corresponding to two vertebrae found in the building foundations of the Hanga Piko ceremonial platform during its restoration (termed "Ahu" in Rapa Nui and where Moais were placed) (Fig. 1). This record may correspond to the remains of an ancient blue whale stranding, the bones of which were used by the early Rapa Nui not only to build supporting structures, but also to make fishing hooks, sculptures and ornaments. More recently, blue whales have been recorded during September 1994 (n = 4) and June 1995 (n = 2) (Aguayo *et al.*, 1998a), which coincides with the hypothesized migration to equatorial waters during the breeding season in the austral winter. These records are supported by investigations reported by Huckle-Gaete (2004) and Huckle-Gaete & Mate (2005) regarding five animals instrumented with satellite transmitters in the Gulf of Corcovado, Chile (43°45'S, 73°30'W) during February 2004. In the austral fall, two whales migrated north and offshore to the Nazca Ridge region (25°S and *ca.* 800 km offshore of Chile), an area where colliding tectonic plates have built underwater ridges and where there is possibly strong upwelling that supports productivity. Huckle-Gaete & Mate (2005) proposed

Table 1. Marine mammals recorded in waters adjacent to Easter Island and Salas y Gómez Island and their current conservation status according to IUCN (International Union for the Conservation of Nature) and the MMA (Ministry of the Environment, Chile): DD: Data deficient, EN: Endangered, VU: Vulnerable, LC: Least concern, IC: Insufficiently known.

Scientific name	Vernacular name	References (*)	IUCN	MMA
Orden Cetacea				
Family Balaenopteridae				
<i>Balaenoptera musculus</i>	Blue whale	1,10	EN	EN
<i>Balaenoptera bonaerensis/acutorostrata</i>	Antarctic/Dwarf Minke whale	1	DD	IC
<i>Megaptera novaeangliae</i>	Humpback whale	1,2,3,10	LC	VU
Family Physeteridae				
<i>Physeter macrocephalus</i>	Sperm whale	1,2,4	VU	VU
Family Ziphiidae				
<i>Ziphius cavirostris</i>	Cuvier's beaked whale	1	LC	IC
<i>Mesoplodon densirostris</i>	Blainville's beaked whale	1	DD	IC
Family Delphinidae				
<i>Pseudorca crassidens</i>	False killer whale	1,3,5	DD	IC
<i>Globicephala macrorhynchus</i>	Short-finned pilot whale	10	-	IC
<i>Tursiops truncatus</i>	Bottlenose dolphin	6	LC	LC
<i>Delphinus delphis</i>	Common dolphin	7	LC	IC
Orden Carnivora				
Family Phocidae				
<i>Mirounga leonina</i>	Southern elephant seal	8	LC	IC
<i>Hydrurga leptonyx</i>	Leopard seal	7,9,10	LC	IC

(*): (1) Aguayo-Lobo *et al.*, 1998a; (2) Townsend, 1935; (3) Garcia, 1989; (4) Whitehead *et al.*, 1996; (5) Cárdenas & Yáñez, 1988; (6) Cárdenas *et al.*, 1986; (7) Steadman *et al.* (1994); (8) Aguayo-Lobo *et al.*, 1995; (9) Aguayo-Lobo *et al.* (2011); (10) this study."



Figure 1. Blue whale vertebrae found during the restoration of Ahu Hanga Piko and now held at the Anthropological Museum 'Father Sebastián Englert' of Easter Island (© R. Huckle-Gaete).

that the Nazca Ridge might be the winter reproduction area for the Chilean blue whales and/or a winter feeding area. If this is the case, the unknown breeding grounds of Eastern South Pacific blue whales might also extend west along this submarine ridge and reach Salas y Gómez Island and Easter Island waters. This supposition should be confirmed if investigations continue in the future.

Antarctic/Dwarf minke whale: while Antarctic minke whales have been reported in Chilean waters from Mejillones (23°20'S) to the Drake Passage, dwarf minke whales were reported for the first time, in a stranding and a sighting in channels off Patagonia, by Acevedo *et al.* (2006). Minke whales were first reported in the study area by Aguayo-Lobo *et al.* (1998a) during September 1993 (n = 4), September 1994 (n = 3) and June 1995 (n = 3), but confirmation was impossible. More recently, Gales *et al.* (2013) reported Antarctic minke whale destinations through satellite tagging in the Antarctic Peninsula as well as one individual that passed some 200 km west of Easter Island and continued northwest. Until further evidence is obtained on the exact species of the minke whale inhabiting or using Easter Island and Salas y Gómez Island waters, we cannot rule out the presence of dwarf minkes.

Humpback whale: Townsend (1935), based on whaler's logbooks from the 18th and 19th centuries, reported a humpback whale during March (no year given) for waters around Easter Island (Fig. 2). More recently, on 8 September 2008, local newspapers (El Mostrador and La Tercera) reported the sighting of a ~15 m humpback whale swimming *ca.* 10 km from

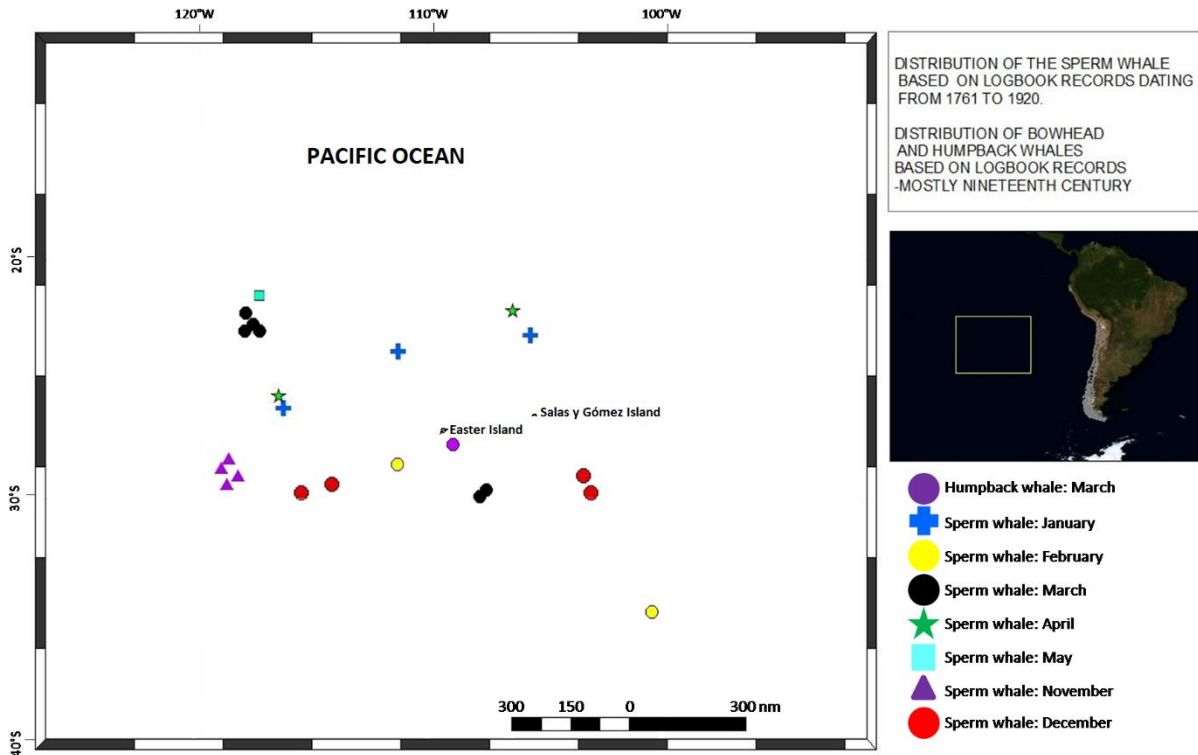


Figure 2. Monthly records of humpback and sperm whales in adjacent waters of Easter Island and Salas y Gómez Island reported by Townsend (1935) from whaler logbooks operating between 1761 and 1920.



Figure 3. Underwater photograph of an apparently juvenile humpback whale diving off Hanga Roa, Easter Island, ca. 2008 by the professional diver Mr. Michel Garcia (© Michel Garcia).

Easter Island. The animal was entangled by its caudal peduncle in fishing gear (gillnet and buoy line). When the animal was as close as 4 km from the coast, a fisherman successfully disentangled the whale. On 3 September 2013, two humpback whales were sighted some 6 km from Salas y Gómez Island by MFM and SY, remaining in the spot for approximately 4 h while seabird surveys were performed on land. During interviews with locals on Easter Island, this species remains present in the collective memory of the

islanders. According to the interviews, numerous reports suggest potential sightings of this species from May to November, although only one sighting was confirmed by the descriptions and photographs we were able to compile (Fig. 3). These potential sightings were usually made West of Hanga Roa (the main town) where most opportunistic observations occurred, off the north coast (Anakena beach), and also off the southwest coast, where a group of islets (motus) are located. We obtained a vivid and detailed narration of an apparent parturition from a local CONAF ranger, Mr. Pedro (Pau) Ito (*pers. comm.*, Nov. 2012). If true, over the next few years we could witness the return of humpback whales to the study area as a potential calving/breeding ground if investigations continue. This hypothesis is supported by the recent work of Horswill & Jackson (2012) where the austral winter presence of this species was reported primarily during late August around Pitcairn Island (25°04'S, 130°06'W), located some 2,000 km west of Easter Island. These authors indicate that singletons and mother-calf pairs were sighted all around Pitcairn Island, in deep offshore and shallow inshore waters. Horswill & Jackson (2012) further indicate that whether the Pitcairn Island humpbacks represent part of a larger local wintering population, or are migrating through the Pitcairn Islands *en route* to wintering

grounds to the west and/or north, is yet to be determined. Furthermore, Horswill & Jackson (2012) suggest that they may belong to the same breeding population as a French Polynesian population (IWC 'breeding stock F'), which could be changing their wintering range in response to environmental factors, or alternatively, expanding their range due to recent population growth. Although we still have no conclusive evidence to suggest that humpbacks regularly occur at Easter and Salas y Gómez islands during winter, if they do, it would be important to investigate their population identity using techniques such as photo-identification and genetic characterization.

Family Physeteridae: the sperm whale has a long history of industrial exploitation in Chilean waters, where it was the most important whaling resource during the 19th and 20th centuries (70% and 75% of all commercial catches, respectively), however they were mostly caught along the Chilean coast with no mention of their occurrence in the study area (Aguayo-Lobo *et al.*, 1998b). Prior to this, Townsend (1935), in his whaler logbooks analyses, indicated a capture of at least 350 to 1,050 sperm whales between 1761 and 1920 in waters adjacent to Chilean oceanic islands (including the Juan Fernandez Archipelago). Within the study area, 22 individuals were caught between November and May, which coincides with the breeding period of the species (Fig. 2). More recently, Aguayo-Lobo *et al.* (1998a) reported two sightings during July 1995, and M. García (*pers. comm.*) reported one juvenile or female individual remaining for a couple of days near Hanga Roa, *ca.* 2010.

Family Ziphiidae: only two species have been recorded in the study area and both were from Easter Island: Cuvier's (*Ziphius cavirostris*) and Blainville's (*Mesoplodon densirostris*) beaked whales. The former was sighted while approaching Easter Island on May 1994 aboard a Chilean Navy ship and the latter was found dead on the southern coast (Vaihu) on 31 August 1994 with visible wounds possibly caused by sharks (Aguayo-Lobo *et al.*, 1998a). This *Mesoplodon* record is only the second confirmed specimen for Chilean waters after the one reported by Pastene *et al.* (1990), which was by-caught by fishermen off Puerto Montt. RHG & MFM were able to access the bone collection of this stranding but, unfortunately, found that the characteristic teeth of the genus were missing and the skull showed visible signs of deterioration (Fig. 4).

Family Delphinidae: Steadman *et al.* (1994) point out that stratigraphic records from Easter Island indicate that "One or more small species of dolphin/porpoise (Delphinidae) is represented by 2,583 bones, more than for any other taxon in the Ahu Naunau

(northern coast near Anakena beach) fauna. Because each of the many diagnostic periotic bones in the assemblage is from the common dolphin, *Delphinus delphis*, we assume that this widespread species (*genus*) is the only delphinid represented." These authors identified the species as *D. delphis* at a time when the long-beaked common dolphin, *D. capensis*, was being reconsidered as a separate species (Heyning & Perrin, 1994; Rosel *et al.*, 1994), so the original identification should be changed to *Delphinus sp.* Another issue is that Steadman *et al.* (1994) indicate the identification was based on the 'diagnostic periotics' of *Delphinus*, but according to the exhaustive study of earbones performed by Kasuya (1973), neither the genus nor the species have diagnostic features in these bones. Clearly this issue needs to be re-evaluated and the matter corrected if necessary. Based on what we currently know about *Delphinus* distribution (*e.g.*, Perrin 2002; Jefferson *et al.*, 2008), there is a high probability that the bones found by Steadman *et al.* (1994) actually correspond to species' from the genus *Stenella* (*S. longirostris*, *S. attenuata* and *S. coeruleoalba*) or *Lagenodelphis* (*L. hosei*).

Dye (1990) (cited by Steadman *et al.*, 1994) indicates that Polynesians hunted delphinids primarily with harpoons from seaworthy canoes, but Hunt & Lipo (2009) suggest that dolphins at Easter Island were likely taken occasionally using small canoes and striking stones together in nearshore waters to disorient the animals' and coax them onto the sandy beach at Anakena -one of the very few places on the island where this strategy would be feasible, and the only location where bone remains are reported in any quantity for the island. Ayres (1979) suggests that delphinid bones are rare from Easter Island faunal assemblages younger than *ca.* 500 BP, and Steadman *et al.* (1994) attributes this dietary shift to the lack of wood available for building seaworthy canoes, an aftermath of the prehistoric deforestation in the island. However, this hypothesis has been contested since, upon European arrival on the island in 1722 (*i.e.*, 289 B.P.), Jacob Roggeveen reports witnessing 'many' canoes approaching the ship to greet the crew (according to Englert, 1974). Based on this information, and especially considering the evidence suggesting that at least five centuries had passed after apparently ceasing the use of dolphins as food, it is surprising that there are no recent sightings of other members of this Family whatsoever, besides groups of bottlenose dolphins (*Tursiops truncatus*) (Cárdenas *et al.*, 1986; in Aguayo-Lobo *et al.*, 1998b) in waters adjacent to Salas y Gómez Island.

False killer whales (*Pseudorca crassidens*) were first reported in the vicinity of Salas y Gómez Island by Cárdenas & Yáñez (1988). Additionally, García (1989)



Figure 4. a) Skeletal remains of *Mesoplodon densirostris* held within the collection of ‘Father Sebastian Englert’ Anthropological Museum at Easter Island. Also shown in the forefront is an ancient cetacean bone carved-sculpture also held in the collection, b) assembled skull and lower jaws of the same animal with the only remaining tympano-periotic complex in the forefront (© R. Huccke-Gaete).

reported another occurrence off Easter Island. Aguayo-Lobo *et al.* (1998a) describes the live stranding of a false killer whale in Apina Cape (Easter Island) on 29 March 1994, which later died after failed efforts to return it to the sea by locals.

More recently, Vega & Cortés (2005) reported the sighting of three long-finned pilot whales (*Globicephala melas*) during November 2004 at 29°30'S, 108°29'W, ca. 320 km southeast of Easter Island, while on board the fishing vessel “TAMI S”. During this sighting, they describe the incidental entanglement of a calf (associated with the same group) in the long-line, which was released by cutting the line. A photograph from this encounter (Fig. 5), however, shows the animal to be more similar to short-finned pilot whales (*Globicephala macrorhynchus*), and we suggest that they remain misidentified pilot whales for the time being.

Order Carnivora

Family Phocidae: although seal (phocids) records are rare in the study area, petroglyphs found in Easter Island indicate that an unidentified seal (termed *pakia*

in Rapa Nui) was an occasional visitor in prehistoric times. In fact, Steadman *et al.* (1994) found three pinniped bones in excavations at Anakena beach, among which an upper left canine was attributed to a leopard seal (*Hydrurga leptonyx*). On 4 August 2002, the first modern sighting of this species from Easter Island was reported by Mr. Alejandro Bugueño, who recorded a female (1.6 m in length and weighing 90 kg) on the beach with several wounds throughout its body and informed to a national newspaper (Diario El Mercurio). The animal was successfully rehabilitated and released. During the winter of 2011, Mr. M. Garcia (*pers. comm.*) reported a juvenile leopard seal in a relatively emaciated condition at Hanga Roa (Fig. 6). The animal was retained in a pool for a few days where it was fed and later released. In 2012 an incomplete cranium and lower mandible was found on the north coast of Easter Island (Ovahe beach) and shown to one of us (SY-P) by a local family (Fig. 7). Dr. Marthan Bester (Department of Zoology & Entomology, University of Pretoria, South Africa) was good enough to examine the photographs and stated the following:



Figure 5. Short-finned pilot whale (*Globicephala macrorhynchus*) caught and freed in long-lining operations in waters within the Exclusive Economic Zone of Easter Island (© R. Vega).

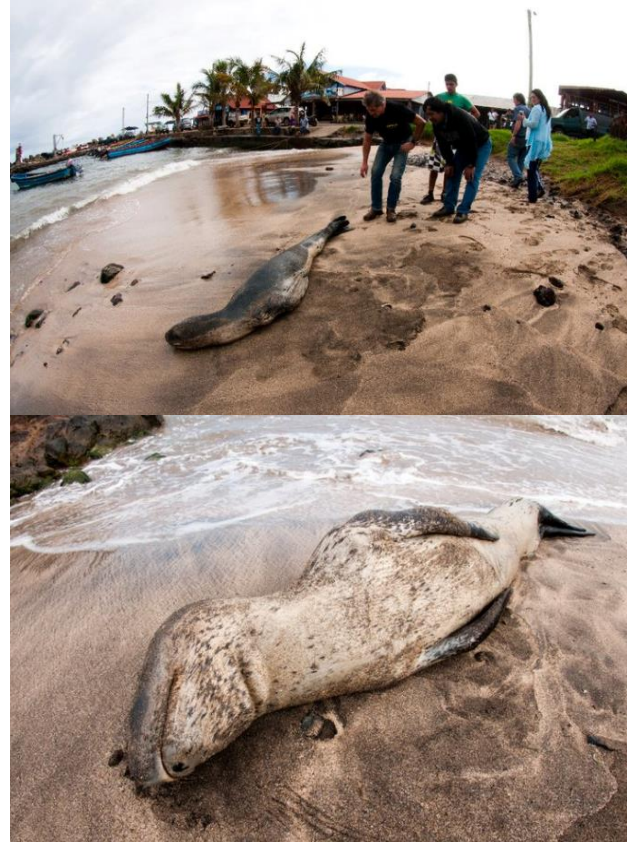


Figure 6. Leopard seal in Hanga Roa recorded during winter 2011, Easter Island (© C. Rapu).



Figure 7. Phocid cranium found in Ovahe beach (N coast of Easter Island) after a storm removed sand and sediment during 2012. a) Dorsal view of the cranium and right mandible, b) right lateral view of the remains of the cranium (© S. Yancovic).

“the missing nasals form a wedge between the frontals; there’s no sign of post [supra] orbital processes, although these might have been lost with the front part of the skull; the sutures visible, between frontals, parietals, squamosum and occipitals are not fused, and

very little sign of ridges/crests, which suggest a sub-adult animal. The back [remaining] part of the skull is about 20 cm long, so a fairly large animal. The right lower jaw tooth sockets seem more complicated than what one would find in elephant seals (single rooted, 5

of them usually). Given that the jaw belongs to the skull depicted, the skull length is approximately 21.5 cm (length of lower jaw) + 5.5 cm (approx distance from jaw hinge to occipital condyles) = 27 cm. Therefore, a subadult, well within the range for both elephant and leopard seals". Because of the fractured condition of the cranium, lack of teeth and our inability to make proper measurements, we cannot confirm the species identification but we hope to in the near future.

Aguayo-Lobo *et al.* (1995) reported the occurrence of a young male southern elephant seal (*Mirounga leonina*) on the southeast coast of Easter Island (Hanga Tee, Vaihu) on 5 January 1995. The authors indicated that this occurrence was probably the most widespread dispersal recorded for the species, reaching some 7,000 km from its closest breeding grounds in the South Shetland Archipelago, Antarctic.

During further conversations and interviews with local islanders and according to their descriptions, it was evident that another pinniped species has also visited the island occasionally, possibly a sea lion (Otaridae). However, we have not been able to identify the species.

CONCLUSIONS

There is a lack of research on the status of marine mammals among Chile's oceanic islands, most notably in the Easter Island ecoregion. Fifteen years have already passed since the last paper on the topic appeared in scientific literature (Aguayo-Lobo *et al.*, 1998a) and, to our knowledge, no new research is planned. Another cause for this lack of research could be the widespread belief that marine mammals are absent from the ecoregion or are unimportant there. For example, expeditions undertaken in the area to date have mostly focused on describing the marine fauna of the recently created Motu Motiro Hiva Marine Park around Salas y Gómez Island, Chile's largest MPA (150,000 km²). Unfortunately, these expeditions have not included marine mammal or seabird specialists, and thus, these opportunities have been lost.

During our recent visits to Easter Island, we found that among the human community there is an interest to know more about these animals, partly because they are still collectively considered of cultural and traditional importance. Park rangers, scuba dive club owners, school children and other stakeholders are eager to increase their knowledge of marine mammals. Dedicated short courses, a communications campaign and coastal field expeditions aimed at building capacity among the Easter Island community are expected to be the way to diminish the knowledge gap we have today.

In the future, these activities might provide the means for fostering nature-based tourism, if the occurrence of some marine mammal species becomes predictable based on scientific research. It is time to start building a research program in Easter and Salas y Gómez islands and link this initiative with others aiming at conserving the impressive biodiversity of these islands, one of the most pristine, isolated and remote landmasses on Earth.

ACKNOWLEDGEMENTS

We thank The Pew Charitable Trust through the Global Ocean Legacy's Easter Island project for providing funds for this study. We specially thank Ernesto Escobar, Rodrigo Vega and Emily Owen, as well as Dr. Miriam Fernandez and her team. We also thank the Captain and crew of the Chilean Navy vessel AP-41 "Aguiles" for their support in the expedition carried out during September 2013. Special thanks also go to CONAF, particularly to its provincial director Ms. Ninoska Cuadros, and the remarkable Park-Rangers Pau Ito, Carlos Salinas and Pedro Lazo. Al Comisionado CODEIPA Sr. Osvaldo Arévalo (Singa) Pakarati has been particularly keen in supporting this investigation by permitting access to the incomplete seal cranium and Carlo Teao for providing boat support during surveys. We also appreciate the help provided by Michel García, Henry García and Cristián Rapu for some of the photographic records and specially their patience during interviews. Finally, special thanks go to Drs. Robert Pitman, Nick Gales, William Perrin and Marthan Bester for providing novel information and/or expert advice.

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