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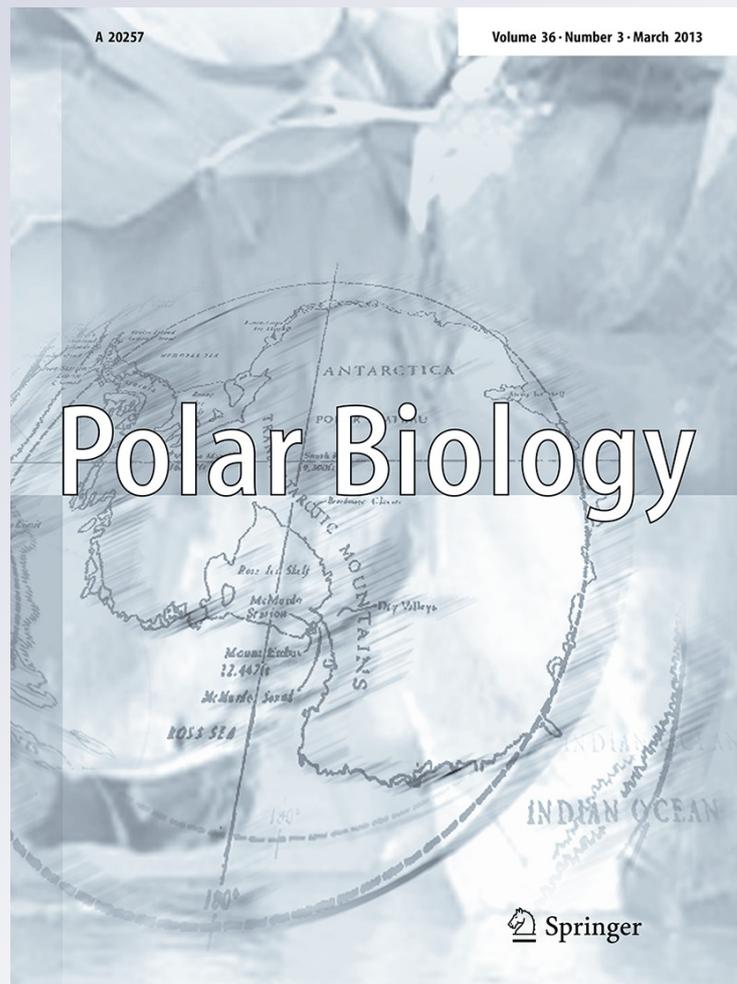
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Residence of the leopard seal in the Magellan Strait: a potential sub-Antarctic population inhabiting the waters of Southern Chile?

Jorge Acevedo · Francisco Martinez

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Abstract The leopard seal is widely distributed on the Antarctic pack ice, but a number of individuals are also thought to disperse north from the pack ice to the sub-Antarctic Islands or venture even farther north. In Chile, the leopard seal has been reported mainly in the Fuegian Archipelago, with individuals sighted year-round; however, the data to date have been unable to determine whether it is the same individuals who remain year-round. Thus, one of the questions to be resolved is whether there is a northward dispersion of individuals from the Southern Ocean returning to the Antarctic continent, or alternatively if there is a potential sub-Antarctic population that delay or suspend their migration toward the Antarctic region. Opportunistic sightings of a solitary seal at Ballena Sound (53°41'S, 72°37'W), Magellan Region, Chile, were documented in photographs on six occasions from January to May 2012. Based on the review of the photographs, the leopard seal was identified as the same individual. This finding provides the first evidence of a long occupation by a leopard seal in the fjords and channels of Fuegian Region, suggesting the existence of a small population inhabiting the waters of Southern Chile year-round.

Keywords Leopard seal · Fuegian Archipelago · Residence · Chile · Francisco Coloane AMCP

Introduction

Five species of pinnipeds, South American sea lion *Otaria flavescens*, southern fur seal *Arctocephalus australis*, southern elephant seal *Mirounga leonina*, leopard seal *Hydrurga leptonyx*, and Antarctic fur seal *A. gazella*, have been recorded in the fjords and channels of Southern Chile (Gibbons and Miranda 2001; Venegas et al. 2002; Acevedo et al. 2011; Aguayo-Lobo et al. 2011). The latter two species are well outside their normal Antarctic ranges.

The leopard seal (*H. leptonyx* de Blainville 1820) is widely distributed on the Antarctic pack ice and south to the edge of the continent with the highest densities in waters adjacent to the Western Antarctic (Forcada et al. 2012). The distribution also includes small permanent concentrations in Antarctic and sub-Antarctic Islands such as Heard (Gwynn 1953; Brown 1957), Auckland, Campbell (King 1983) and Kerguelen (Paulin 1952; Bester 1981; Bester and Roux 1986). Small seasonal groups have also been recorded in Malvinas-Falkland (Hamilton 1939), South Georgia (Hamilton 1939; Walker et al. 1998), Macquarie (Rounsevell and Eberhard 1980), and Marion (Bester et al. 2006) Islands.

Traditionally, the movement of leopard seals has been from the Southern Ocean in front of the Antarctic Polar Front during the northward extension of the pack ice in winter (e.g., Hamilton 1939; Rounsevell and Eberhard 1980; Bester and Roux 1986; Bester et al. 1995; Jessopp et al. 2004). The seals then return south toward the Antarctic continent during austral spring (Erickson et al. 1971). Along the coast of Chile, 115 sightings of leopard seals have been reported, mostly distributed in the Fuegian Archipelago (87 individuals). Sightings have included immature and adult individuals of both sexes throughout the year in glacial areas, especially Tierra del Fuego Island

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(south of 53°43'S) (Aguayo-Lobo et al. 2011). Although the observations presented by Aguayo-Lobo et al. (2011) indicate a year-round presence of leopard seals in the fjords and channels of South America, the observations do not provide information on whether it is the same individuals who remain year-round. This note presents evidence that some leopard seals do not return to the Antarctic continent, which may constitute a stable sub-Antarctic population in the marine fauna of Southern Chile.

Materials and methods

The sightings were recorded by crew members aboard the tourist vessel *M/N "Forrest,"* which sails periodically from December to May in the waters of the Francisco Coloane Marine and Coastal Protected Area (AMCP) (Fig. 1). Non-scientific crews are often aboard the *Forrest* in those trips; therefore, the sightings used in this article are based on the logbook annotations and photographs of the second author. The sightings were made from a 4.7-m inflatable boat with outboard 40-hp Yamaha engines. Based on the review of these photographs, the first author made the species identification and used the pelage patterns to identify the seal across the summer/fall months.

Results

A solitary leopard seal was sighted and photographed on six occasions in Ballena Sound at 53°41'S, 72°37'W

(see Fig. 1) during 15 visits from November 20, 2011 to May 27, 2012. Weather conditions at the time of each sighting were optimal with a swell of 0.2–0.5 m and a wind speed less of 10 km.

The first sighting was made on January 5 at 09:19 AM. A solitary leopard seal was seen and photographed resting on a flat rocky platform close to the water (Fig. 2). During the approach with the inflatable boat to the rocky platform, the seal showed no avoidance behavior to human presence. On February 25 at 10:40 AM, a leopard seal was sighted swimming between an ice float and the glacier of Ballena Sound. The seal approached the inflatable boat, which lasted for several minutes, showing its head and neck above the sea surface. An hour later, the seal was seen resting on the same flat rocky platform previously referred to above. In March, five visits were made to Ballena Sound, but no leopard seals were sighted. On April 8 at 10:23 AM, a leopard seal was seen swimming between an ice float and the glacier of Ballena Sound; the seal was inquisitive, swimming under the inflatable boat, and showing its head above the sea surface. Finally, in May, three sightings of a single leopard seal were made on the 1st, 22nd, and 27th: on the first date, a leopard seal was seen resting on the same flat rocky platform as previously mentioned; on the second date, a seal was observed swimming near the same flat rocky platform; and on the last date, a leopard seal was seen swimming near a sill of 2 m in Ballena Sound. In all cases, the seal being observed showed no avoidance behavior to the inflatable boat.

Based on the review of photographs taken during the six sightings, the leopard seal was identified as the same

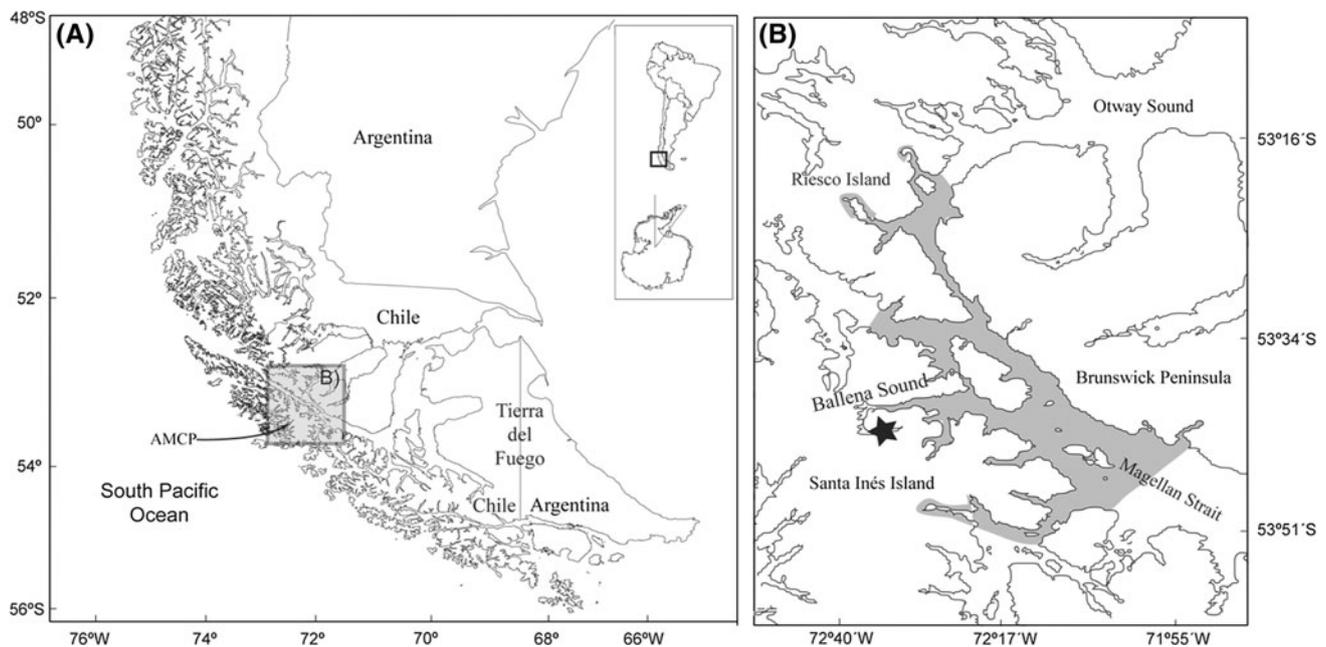


Fig. 1 Sighting location of leopard seal (*star*) in Ballena Sound between January and May 2012. Francisco Coloane AMCP is shown in gray



Fig. 2 Sighting of the leopard seal on a flat rocky platform and the distinctive mark located on the *left side* of the lower jaw (*arrow*). Photographs from January, February, and April 2012

individual by the presence of a distinctive open circle located on the left side of the lower jaw (see Fig. 2). This individual was a male estimated to be 3.0 m in body length and in excellent physical condition. No other individuals were observed in the photographs.

Discussion

The movements of leopard seals are difficult to study because of their solitary nature (Southwell et al. 2008); however, a number of leopard seals are thought to disperse north from the pack ice to the sub-Antarctic Islands (e.g., Gwynn 1953; Bester and Roux 1986, Rounsevell and Eberhard 1980) or venture even farther north (e.g., Best 1971; Horning and Fenwick 1978). In contrast, small numbers of all ages have been observed throughout the year at Kerguelen (Bester and Roux 1986) and Heard (Gwynn 1953; Brown 1957) Islands, and seasonally at other locations such as Macquarie (Gwynn 1953; Rounsevell and Eberhard 1980) and Bird (Walker et al. 1998; Jessopp et al. 2004) Islands.

The leopard seal is primarily an animal of the Antarctic pack ice, and the majority of the adult population never leaves the Antarctic pack ice (Rogers et al. 2005; Nordøy and Blix 2009). There is evidence, however, of a northward migration by part of the population to the outer Antarctic and sub-Antarctic islands during the winter (Hamilton 1939; Gwynn 1953). This dispersion has been attributed to the northward extension of the pack ice during winter (Rounsevell and Eberhard 1980; Bester and Roux 1986; Bester et al. 1995; Jessopp et al. 2004). During the austral spring and summer, seals return back toward the Antarctic continent (Erickson et al. 1971), remaining largely within this outer fringe as the pack ice retreats (Bester et al. 1995). Immature animals likely (Bester et al. 2006) travel the farthest in the northward migration, although a few older seals also appear to move large distances.

The presence of leopard seals in Chile has been reported mainly to the south of 40°S, especially at Parry fjord and

D'Agostini Sound, Fueguian Archipelago, with the first documented sighting in 1927 (Aguayo-Lobo et al. 2011) and the first documented sighting of multiple seals in 1971 (Markham 1971). The presence of leopard seals at Ballena Sound is infrequent with only three sightings documented between 1927 and 2011 (Aguayo-Lobo et al. 2011). Still, the authors reported the presence of both males and females of all ages (adults and juveniles) and in good condition from summer to spring in the Fueguian channels, suggesting that leopard seals may remain year-round. Unfortunately, the data in Aguayo-Lobo et al. (2011) could not be used to assess whether the same individuals remained year-round or migrated repeatedly from the Antarctic considering the close proximity of the Fueguian channels area with the Antarctic continent (508 nm).

As pointed out by Markham (1971) and Aguayo-Lobo et al. (2011), the thermal characteristics of some Chilean fjords (e.g., Parry fjord and D'Agostini Sound) are very similar to the Antarctic habitat (e.g., similar water and air temperatures and presence of pack ice), providing a favorable habitat for the leopard seal. Ballena Sound is also similar to the Antarctic habitat, although it does not have adequate sized floes for seals to haul out. Nevertheless, the fjord is close to an area of locally high abundant food resources such as Magellan penguins (*Spheniscus magellanicus*), seabirds, fishes, lobster krill, otariids, euphausiids, and cephalopods. This individual could have been attracted to this location given the high availability of these prey items throughout the summer and fall seasons. This hypothesis is partially supported by the observation by Aguayo-Lobo et al. (2011) of brown scats suggesting a diet comprised of fish, and the stomach analysis of an adult female killed at Parry fjord containing the remains of fish and Magellan penguin (Markham 1971).

The 5-month residence of an adult leopard seal in Ballena Sound suggests that individuals that inhabit the Fueguian region may not return to the Antarctic in spring or summer. It is important to note that remaining in northern waters at this time would mean that they would not be present in the population during the breeding season

in spring and early summer months (Southwell et al. 2003). Although the observations presented here are limited, they suggest the potential for a stable sub-Antarctic population that remains year-round in the Southern area of South America as has been suggested by some previous authors (e.g., Markham 1971; Torres et al. 1979; Aguayo-Lobo et al. 2011). Further researches, such as tagging and satellite telemetry studies, together with additional sampling for genetic analysis are required to understand the local movements and residency of these animals and the potential migration between the southern fjords of South America and Antarctica and/or sub-Antarctic Islands.

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