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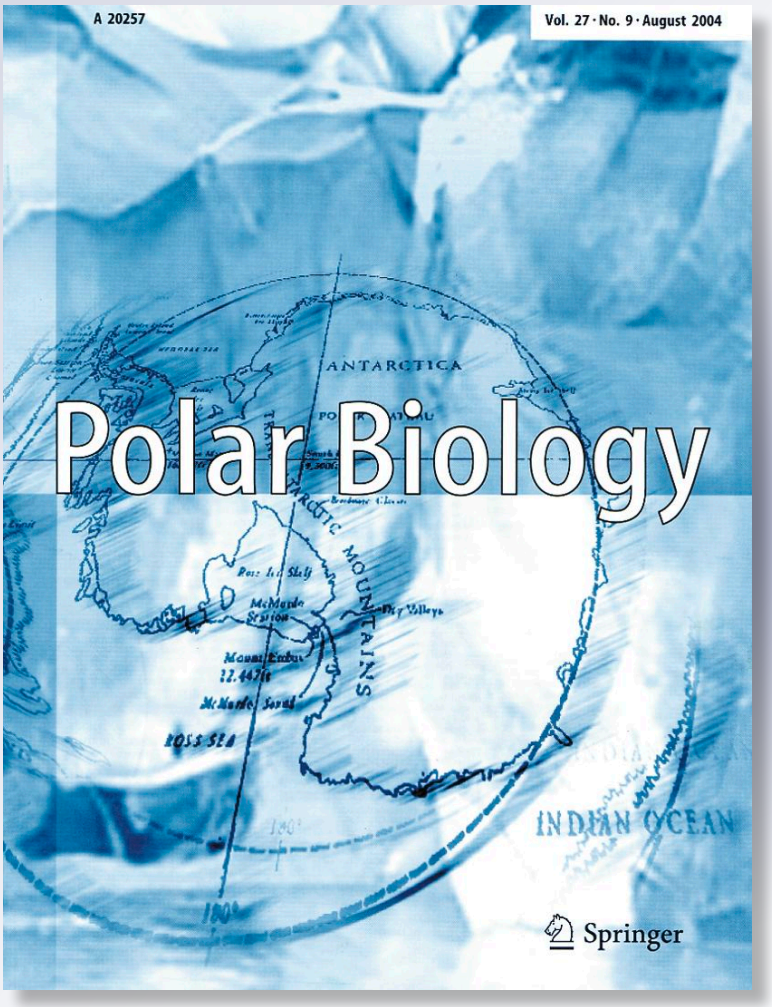

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SHORT NOTE

Vagrant Subantarctic fur seal at Cape Shirreff, Livingston Island, Antarctica

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Abstract A vagrant adult male Subantarctic fur seal *Arctocephalus tropicalis* was observed among Antarctic fur seals *A. gazella* at Cape Shirreff, Livingston Island, Antarctica, which is located to ~4,190 and ~5,939 km from the nearest breeding colonies of Subantarctic fur seals. Although the colony of origin of this animal and the reason for its movement outside its distribution range are unknown, this sighting shows the high dispersal capacity of this species and provides an insight into possible changes in its distribution. Although this vagrant was not observed with females Antarctic fur seal, news sightings in the future could result in viable hybrid, and introgressive hybridization could represent a threat for Cape Shirreff population recovery, if still the population way to go to recover to presailing levels.

Keywords *Arctocephalus tropicalis* · Fur seals · South Shetland Islands · Dispersion

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Introduction

The Subantarctic fur seal, *Arctocephalus tropicalis* Gray, 1872, hauls out to breed on islands north of the Antarctic Polar Front (APF) (Bester 1984), with the major concentrations occurring on cool-temperate Gough Island in the South Atlantic and Amsterdam Island in the Indian Ocean, as well as at the Subantarctic Prince Edward Islands Archipelago in the Indian Ocean. Smaller colonies are also found on Île Saint Paul, Île de la Possession (Îles Crozet), the Tristan da Cunha group, and Macquarie Island (Bonner 1981; Bester et al. 2003, 2006; Hofmeyr et al. 2006a; Lancaster et al. 2006). Moreover, small numbers haul out south of the Antarctic Polar Front (APF) on Subantarctic Heard Island, where single pups have been recorded during a number of seasons since 1987 (Goldsworthy and Shaughnessy 1989, http://www.seals.scar.org/pdf/statusofstocs.pdf) (Fig. 1).

Recent studies of foraging ecology have provided considerable information on the marine movements and dispersion of lactating females Subantarctic fur seal within their distribution range (e.g., Bester 1989; Georges et al. 2000; Robinson et al. 2002; Beauplet et al. 2004; de Bruyn et al. 2009). However, a great deal remains unknown, and vagrant individuals, mostly males, have been recorded at great distances (up to 7,000 km) outside of their common distribution range.

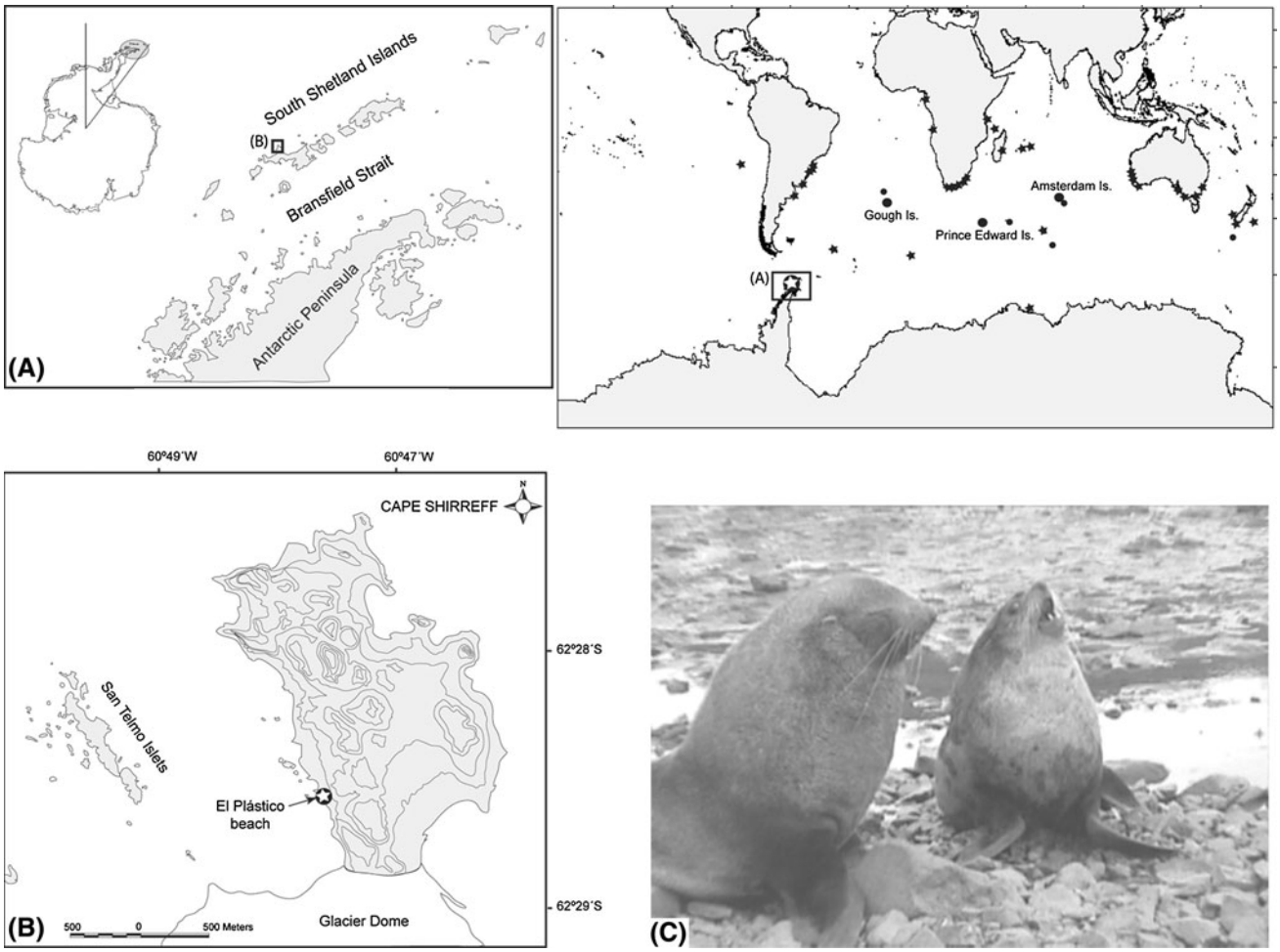

Fig. 1 Map showing location of sites mentioned in the text. In map **a** *filled circle* shows the breeding concentrations and the *stars* indicate the location of recorded vagrants of *A. tropicalis*. In map **b** the *encircled star* indicate the location of sighting at Cape Shirreff referred in the text. Map **c** shows the vagrant adult male Subantarctic fur seal together with an Antarctic fur seal sighted at "El Plástico" beach

Extraterritorial occurrences of individual of Subantarctic fur seal (known as vagrants, see Fig. 1) have been reported on the coasts of Africa (Shaughnessy and Ross 1980; Carr et al. 1985; Zanre and Bester 2011), South America (Brazil, Uruguay and Argentina) (Castello and Pinedo 1977; Ximénez 1980; Pinedo 1990; González et al. 1994; Oliveira et al. 2001; Naya and Achaval 2006; Ferreira et al. 2008), and Australia (Gales et al. 1992; Mawson and Coughran 1999, http://www.bie.ala.org.au/species/urn:lsid:biodiversity.org.a), and on islands such as Alejandro Selkirk in Juan Fernandez Archipelago (Torres and Aguayo-Lobo 1984; Torres et al. 1984), New Zealand (Taylor 1990), the Comores (David et al. 1993), Madagascar (Garrigue and Ross 1996), Mauritius and Rodrigues (David and Salmon 2003), and Zanzibar, Tanzania (Hofmeyr and Amir 2010). Some of these extraterritorial movements may have resulted in hybridization with other *Arctocephalus* species (Torres et al. 1984). To the best of our knowledge, some vagrant Subantarctic fur seal have only been reported south to the APF at South Georgia (54°30′S, Payne 1979), Bouvet Island (54°25′S, Hofmeyr et al. 2006b), and Îles Kerguelen (49°20′S, Wynen et al. 2000). The southernmost record is reported at Mawson station, Antarctica (67°36′S, Shaughnessy and Burton 1986). In view of the above, here we report on the first sighting of a vagrant Subantarctic fur seal in the most important breeding colonies of Antarctic fur seal at South Shetland Islands, Antarctica.

Materials and methods

Cape Shirreff and San Telmo Islets, Livingston Island (62°27′S; 60°47′W), recognized as Antarctic Specially Protected Area (ASPA) No. 149 (see Fig. 1), shelters the most important breeding colonies of Antarctic fur seal (*A. gazella* Peters, 1875) on the South Shetland Islands (Aguayo-Lobo 1978; Bengtson et al. 1988; Meyer et al. 1996). As part of the field work of INACH 018 Project "Ecological studies on the Antarctic fur seal, *Arctocephalus*

gazella", periodic censuses of Antarctic fur seal were carried out by seal biologists and field assistants, starting from early December to late February on all beaches of the southwest, west, and north coasts of Cape Shirreff, while the few beaches on the east coast were searched at least twice per month. While performing standard research activities, unusual sightings of vagrant bird or mammal species have continually been approached in a discreet manner, intending not to disrupt the animal's behavior, while recording and photographing interactions with other species.

Results

On December 17, 2005, an adult male Subantarctic fur seal was seen by one of us in "El Plástico" beach, where peripheral adult male and juvenile Antarctic fur seals are common. The identification of *A. tropicalis* was based in their short head, robustness build, pale face and neck, tuft of hair on top the head, as well as it's broad and relatively short fore flippers in comparison to those of an Antarctic fur seal (see Fig. 1). This individual was apparently in excellent physical condition and remained on the beach until January 10, 2006. No tags were observed on its fore flippers. During the subsequent visits to the where the vagrant was located performed between December 17, 2005 to January 10, 2006, this fur seal was observed resting in prone position, with adult male Antarctic fur seals blocking its path to the water. Avoidance behavior was evident to human presence. After that date, "El Plástico" beach as well as other beaches of the Cape were visited on several occasions but the individual was not seen again.

Discussion

The record of an *A. tropicalis* at Cape Shirreff is an unusual event; the only vagrant Subantarctic fur seals recorded south of the APF have been reported at South Georgia (Payne 1979), Bouvet Island (Hofmeyr et al. 2006b), Îles Kerguelen (Wynen et al. 2000) and Mawson station, Antarctica (67°36′S, Shaughnessy and Burton 1986). To the best of our knowledge, our record of an adult male Subantarctic fur seal is the second southernmost record for the species.

Given the lack of identification tags, it is difficult to establish the colony of origin of this individual, given that vagrant Subantarctic fur seals are capable of moving remarkable distances from their natal colonies (up to 7,000 km) (Torres et al. 1984; Bester 1989; Ferreira et al. 2008). Non-vagrant lactating females are also capable of moving long distances (<2,000 km) (Georges et al. 2000; Robinson et al. 2002; Beauplet et al. 2004; de Bruyn et al. 2009).

The nearest breeding colonies of Subantarctic fur seals to Cape Shirreff (62°27′S) are ~4,190 and ~5,939 km to northeast on Gough Island in the South Atlantic and the Prince Edward Islands Archipelago in the Indian Ocean, respectively. These two localities harbor 85% of the global population of this species (http://www.seals.scar.org/pdf/statusofstocs.pdf). While long-range movements from their natal site, including against the direction of flow of oceanic currents do not seem to be a hindrance for penguins and pinnipeds (e.g., Torres et al. 1984; Fabiani et al. 2003; Ferreira et al. 2008; Biuw et al. 2010), many of the vagrant Subantarctic fur seals reported on the Atlantic coast of South America are found in either debilitated conditions or dead (Castello and Pinedo 1977; Naya and Achaval 2006; Ferreira et al. 2008). Given the good physical condition of the vagrant reported here, we speculate that this animal may have rested by making fortuitous rest stops during its movement toward the southwest, on Subantarctic islands, while crossing the strong eastward flow of the Antarctic Circumpolar Current in areas associated with high oceanographic heterogeneity (e.g., anticyclonic and cyclonic eddies). In fact, these sharp spatial variations in ocean currents were associated with a long-range migration of a chinstrap penguin from Bouvet to South Sandwich Islands (Biuw et al. 2010).

Alternatively, the vagrant specimen could also have reached Cape Shirreff with assistance of the West Wind Drift, moving clockwise around Antarctica from its natal colony. Similar paths have been suggested for a vagrant Subantarctic fur seal from Amsterdam Islands found at Alejandro Selkirk, Juan Fernandez Archipelago, (Torres et al. 1984; Ferreira et al. 2008) and for seals from Crozet Islands found on the Brazilian coast (Ferreira et al. 2008), as well as for southern elephant seals *Mirounga leonina* (Fabiani et al. 2003; Bester and Reisinger 2010; Reisinger and Bester 2010).

This species suffered severe population reduction, between the eighteenth and twentieth centuries, with the local extinction of some colonies. After the cessation of sealing, surviving populations grew rapidly and historical breeding sites were recolonised (Wynen et al. 2000). It has been suggested that the dispersion of individuals outside their normal distribution ranges may be linked to high rates of population increase and increased density at optimal breeding sites (Bester 1981; Pinedo 1990).

The marine environment is highly dynamic, with large scale changes considerably altering environmental variables and prey structure over a time (Hare and Mantua 2000; Weimerskirch et al. 2003). This may affect the foraging patterns of marine predators and their reproductive success (Lea et al. 2006). Increases in the sea surface temperature due to global warming, or anomalies in the ocean currents or other oceanographic factors, such as El

Niño Southern Oscillation (ENSO) events, may also drastically change marine productivity in the short to mid-term (months to years) (Fiedler 2002), altering the location of foraging zones and reproductive success in marine predator species (Trillmich and Limberger 1985; Guinet et al. 1994; Lea et al. 2006). These changes have been suggested as a possible explanation for the high numbers of vagrant of Subantarctic and Antarctic fur seals recorded on the eastern coast of South America in specific years (Oliveira et al. 2001). ENSO events have also been suggested as explanations for the dispersion and establishment of new colonies of South American fur seals *A. australis* in the north of Chile (Torres 1985). Negative anomalies in the Southern Ocean Index (see http://www.cpc.noaa.gov/data/indices/), as evidence during 1997/1998 and 2004/2005 summers, may have led to a weaker Antarctic Polar Fronts that shifted south during the winter (Aguayo-Lobo et al. 1998).

The presence of this vagrant at Cape Shirreff at the beginning of the Antarctic fur seal breeding period is important because it cautions that, in addition to the high dispersal capacity of this fur seal species, interbreeding with other *Arctocephalus* species (Condy 1978; Torres et al. 1984; Goldsworthy et al. 1999; Wynen et al. 2000; Hofmeyr et al. 2006a). Although this vagrant was not observed with females Antarctic fur seal, news sightings in the future could result in viable hybrid fur seals (Kerley 1983; Lancaster et al. 2006; Kingston and Gwillian 2007; Goldsworthy et al. 2009), and introgressive hybridization could represent a threat for Cape Shirreff population recovery, if still the population way to go to recover to presailing levels.

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