

# South Western Patagonian Continental Shelf IMMA

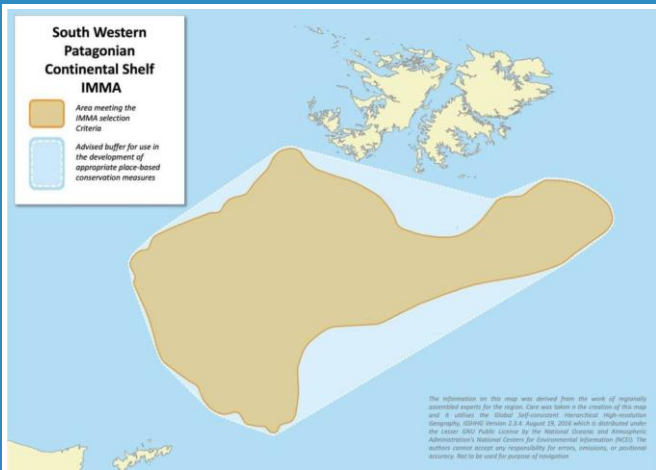
*“Since 1965 the nomenclature used by the United Nations for statistical processing is Falkland Islands (Malvinas), which acknowledges the dispute that exists concerning the sovereignty of the Islands.*

## Description:

This IMMA is located in the southern part of the South Atlantic Ocean (Marschoff et al., 2017).

Geographically, the IMMA is delimited by the Patagonian Continental Shelf to the north west, by the Falkland (Malvinas) Islands (hereafter referred as the “Islands”), the Continental Shelf to the north and north east, the Burdwood Bank to the south, and the Isla de Los Estados (Argentina) to the south west. The area is partially overlapped with the western extreme of the Falklands (Malvinas) Chasm, which divides the Islands from the Burdwood Bank, and to the southern part of the Falklands (Malvinas) Embayment.

The IMMA partially overlaps with the 400-600 m deep channel that connects the Drake Passage and Scotia Sea to the Falklands (Malvinas) Chasm. The area is characterized by the mixing of the water of Sub-Antarctic origin with the shelf water of continental origin. Altogether, the water circulation of the IMMA shows a two layer water system, with the upper layer dominated by mixed shelf water and the lower layer by water of Sub-Antarctic origin. The area comprised by the IMMA is adjacent to the continental shelf but includes water deeper than the ones of the Burdwood Bank (to the south), of the Patagonian Continental Shelf (to the west), and of the Islands Continental Shelf (to the north). All together, it is an area of mid-depth waters enclosed by shallow continental waters.



## Area Size

61 999 km<sup>2</sup>

## Qualifying Species and Criteria

Southern elephant seal – *Mirounga leonina*

Criterion C (2); D (1)

## Summary

Sea Lion Island is the main breeding colony of southern elephant seals in the Falkland Islands (Malvinas)\*, and is the only one regularly monitored, and the only one showing a proven increase in numbers over time. Although Sea Lion Island breeding females show a variety of feeding strategies, most of them forage in localized areas of a small part of the Southern Patagonian Shelf, located between the Islands and the Burdwood Bank, relatively close to the breeding colony and in relatively shallow waters. This area is very important for a crucial part of the life cycle of the breeding females, which are the key demographic component for the future of the species in the Islands. Moreover, their feeding strategy is different from the long loops in deep waters at the edge or outside of the continental shelf adopted by females from other populations of the South Georgia stock. At least 18 cetacean species have ranges overlapping with the IMMA but there is as yet little information on their occurrence.

From an ecological point of view, the main feature of the area is the upwelling of water of Sub-Antarctic origin with high salinity, low temperature, and high oxygen saturation that results in high nutrient level and high primary productivity, among the maximum observed in the whole South Atlantic Ocean.

Therefore, the waters in the IMMA show a high zooplankton density and it is a very important feeding and spawning ground for many squid and fish species, including various species of commercial importance (Agnew, 2002). The abundance of cephalopod species, which is directly linked to the oceanographic features of the area (Rodhouse et al., 1992; González et al., 1999), supports a large number of top-predator species (Baylis et al., 2019). The usage of the IMMA by other marine mammal species, and cetaceans in particular is very likely, but there is no specific tracking or survey data. Based on species distribution maps (IUCN Marine Mammal Spatial Data, <https://www.iucnredlist.org/resources/spatial-data-download>) at least 18 cetacean species have ranges that overlap the IMMA.

The IMMA is adjacent to two already protected areas, the Falkland Islands Key Biodiversity Area (Handley et al., 2023) and the Namuncurá (Burdwood Bank) Marine Protected Area (Schejter et al., 2016), to the IMMA of the Isla de Los Estados and several other IMMAs. The IMMA is fully enclosed by the Falkland (Malvinas) Islands Exclusive Economic Zone (~74% of the area) and the Argentina Exclusive Economic Zone (~36%). The area supports fisheries of various commercial species (reviewed in Agnew, 2002), and in particular the Southwest Atlantic squid fishery (Arkipkin et al., 2013).

To delineate the IMMA, the satellite tracks of elephant seals (n = 13 females) were used to obtain the 50% (core area) and 95% (home range) contours and the boundaries were drawn considering the oceanographic and bathymetric features of the

habitat.

## **Criterion C: Key Life Cycle Activities**

### **Sub-Criterion C2: Feeding Areas**

The formerly very large southern elephant seal population of the Islands was exterminated during the commercial sealing operations of the 19th century (Strange, 1972). The population showed little recovery, and currently comprises only small colonies, of uncertain status and not regularly monitored. The only exception to this is Sea Lion Island, which is not only the largest colony (730 breeding females, 2022 estimate, Elephant Seal Research Group, ESRG, unpublished data), but it is also the only one with a documented increasing trend in size (2.1% per year, 2003-2022, ESRG unpublished data, see also IMMA "Sea Lion Islands Group"). Therefore, the most important demographic class of that population, the breeding females, play a crucial role for the maintenance of the breeding presence of the species in the Islands. The majority of Sea Lion Island breeding females use the IMMA as their main feeding ground during the post-breeding migration at sea. Therefore, this area is not only very important for the conservation of the localized population of Sea Lion Island, but it is important for the conservation of the Islands biodiversity at large because it is the main feeding area of the main component of the Islands southern elephant seals.

Genetic differentiation of the populations of the South Georgia stock is low, with the only notable exception of the Valdes Peninsula (Fabiani et al., 2003). On the other hand, Sea Lion Island is demographically isolated (Galimberti & Boitani, 1999), and breeding females show strong philopatry and breeding site fidelity (Fabiani et al., 2006). This is confirmed by a long-term tag-resight study (1995-2023, 28 fully tagged pup cohorts, ~16000 individuals; ESRG, unpublished data), which shows that: 1) there is

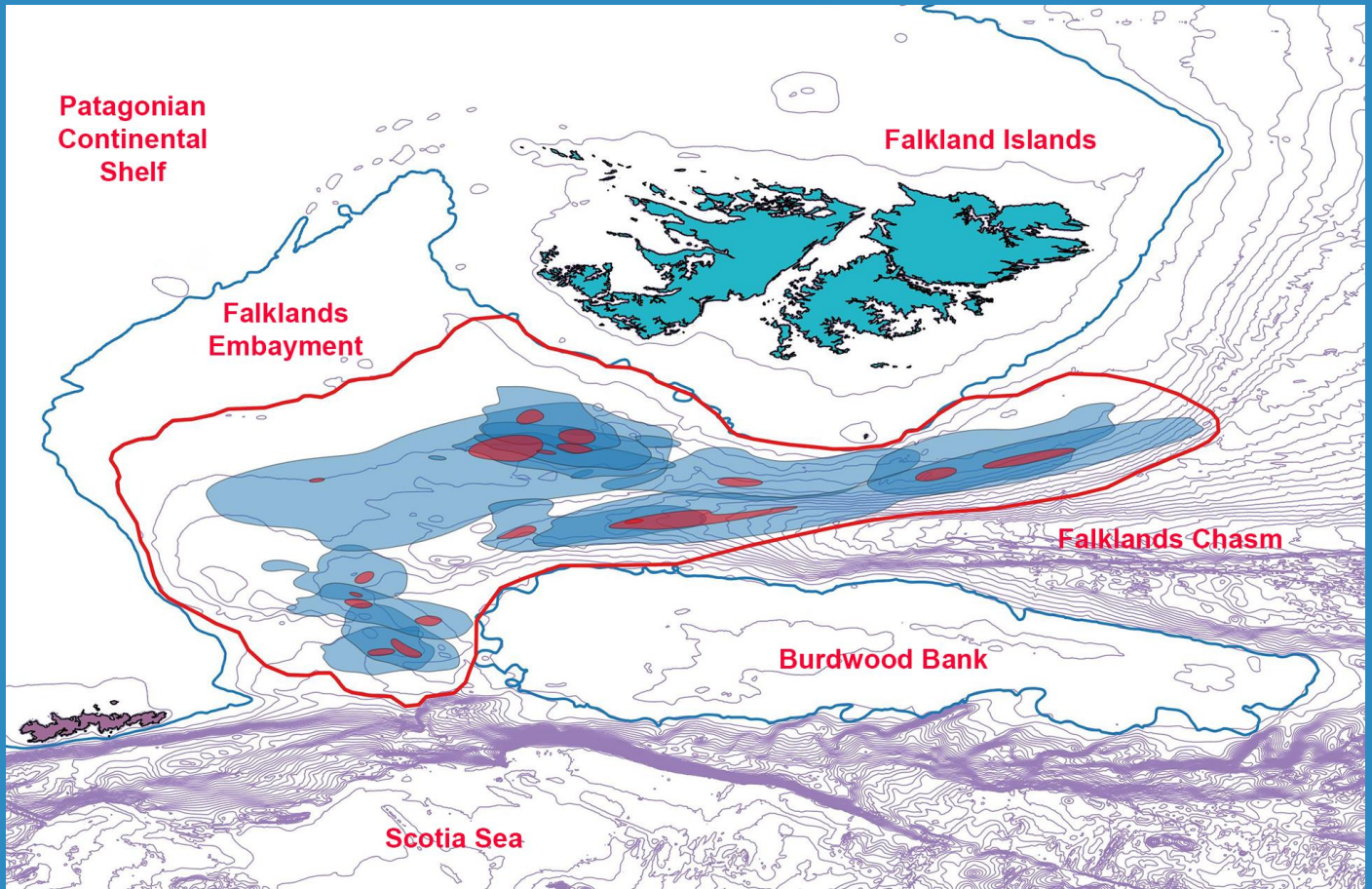


Figure 1: Foraging areas of post-breeding southern elephant seal females of Sea Lion Island. Red areas = core feeding areas (50% kernel density), blue areas = home ranges (95% kernel density). Blue line = 200m isobaths, red line = IMMA, thin lines = GEBCO version 2022 bathymetry. Credit: Elephant Seal Research Group

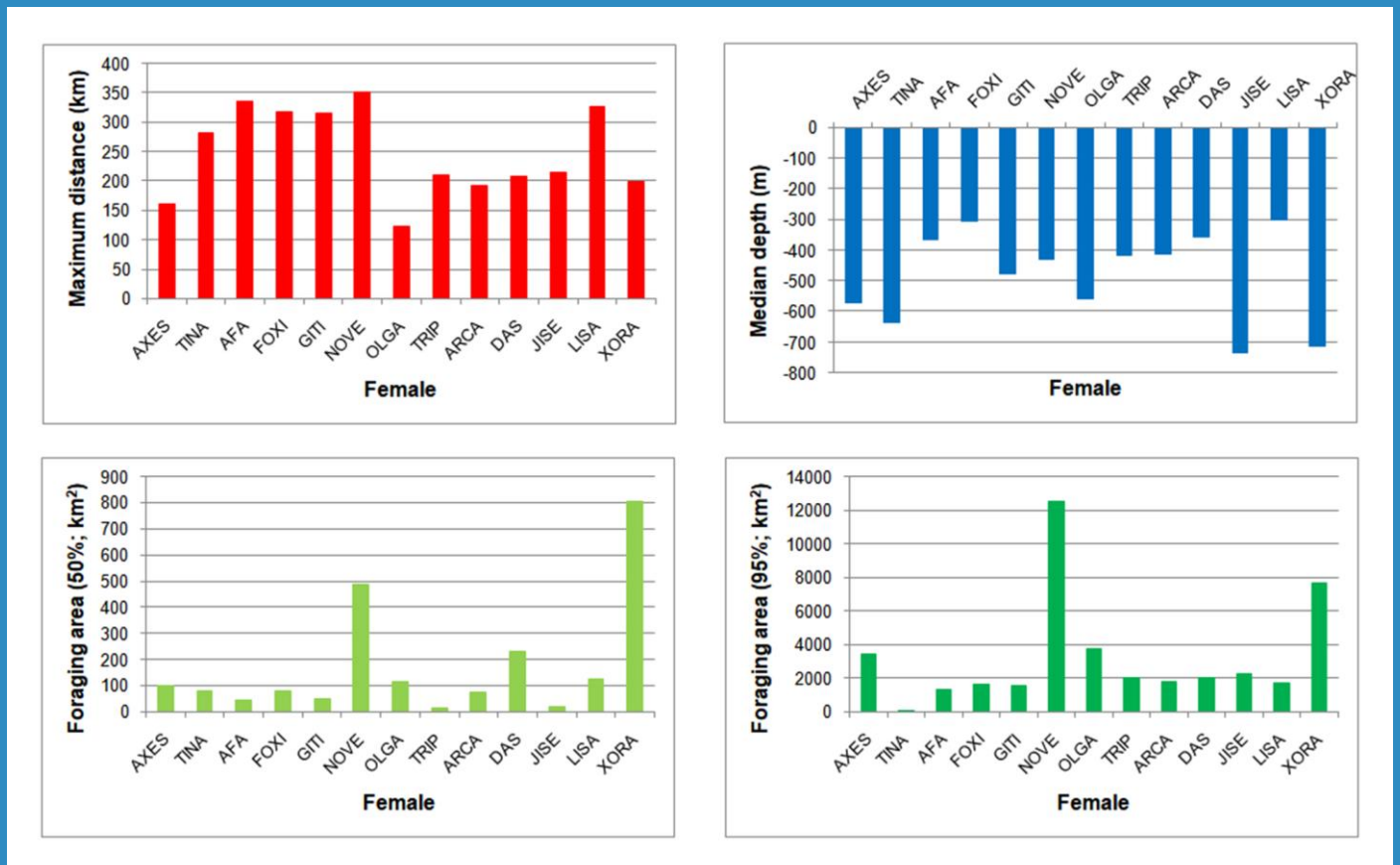


Figure 2: Bar charts of female foraging traits, including: maximum distance from breeding colony (km), median depth of water on foraging areas (m), 50% and 95% kernel density estimates of foraging area (km²). Credit: Elephant Seal Research Group



Figure 3: Female AXES with SPOT5 satellite tag, and pup almost ready to be weaned. Photo credit: Elephant Seal Research Group

no immigration of breeding females; 2) skipping of breeding, temporary emigration to other breeding colonies, and permanent emigration of females are very rare; 3) there is occasional immigration of male breeders (see also Fabiani et al., 2003) but it is exceedingly rare; 4) there is abundant haul out of Southern Elephant Seals from all other populations of the South Georgia stock but only during the moulting season and during the winter haul out.

### **Criterion D: Special Attributes**

#### **Sub-Criterion D1: Distinctiveness**

Post-breeding southern elephant seal females usually carry out long migration and feeding loops over deep waters, very far from their breeding colonies (South Georgia: McConnell & Fedak, 1996; Valdés Peninsula: Campagna et al., 1995). Sea Lion Island females show a variety of feeding strategies; some females adopt a feeding strategy similar to the

ones mentioned above for other populations, moving along long loops either north of the Islands (13.0% of 23 females), south towards the Antarctic Peninsula (1 female) or going to the Pacific side of South America, in very deep waters in front of the coast of Chile (17.4 %; track maps in Galimberti & Sanvito, 2012). This variability and individuality of movements at sea are mirrored in the variability of feeding niche and diet as shown by stable isotopes analysis (Rita et al., 2017).

Notwithstanding this, the majority of the Sea Lion Island breeding elephant seal females (65.3%) show a specific foraging strategy based on a fast migration to a localized feeding area, followed by a rapid return to Sea Lion Island or nearby islands for the moult. This feeding area is located between the Islands and the Burdwood Bank, close to the breeding colony and in relatively shallow waters (maximum water depth of foraging fixes = -295 to -774) (Galimberti & Sanvito, 2012).

The mean maximum distance from the breeding colony of the 13 tagged females feeding in this area was 249 km (122-350), while it was 714 km (613-833) for three females that foraged north of the Islands, and 1386 km (1147-1691) for five females that foraged over long loops towards the Antarctic Peninsula or the Pacific Ocean. The mean maximum distance from the breeding colony reached during the post-breeding migration was 1031 km at Marion Island (607-1460, n = 9 females; Jonker & Bester, 1998) and 1022 km at Valdes Peninsula (813-1223, n = 6 females; Campagna et al., 1998). Very long loops (maximum distance from breeding colony up to 3000 km) were also shown by South Georgia females (McConnell & Fedak, 1996).

Hence, most Sea Lion Island elephant seal females show a rather unique feeding strategy, quite different from the main foraging strategy of other populations of the South Georgia population. Overall, the strategy is apparently very successful, because the population is increasing and shows very little pre-weaning pup mortality (1-2% with little variation among cohorts; Galimberti & Boitani, 1999), and the average weaning weight is on the high side of the species range (female weanling = 135 kg, male weanlings = 137kg, Galimberti & Boitani, 1999) when compared to other populations (Burton et al., 1997).

## Supporting Information

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