

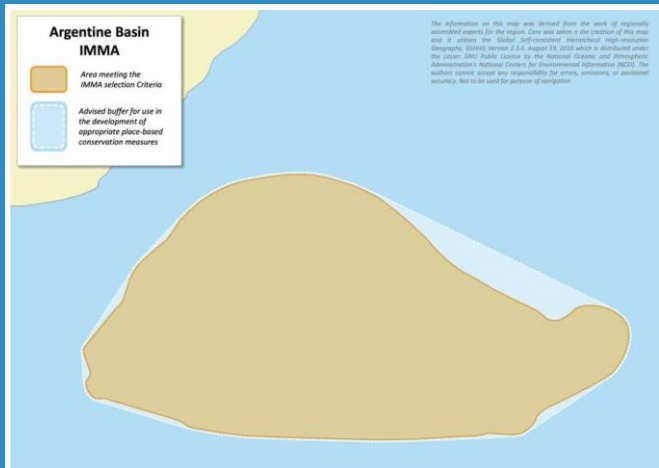
# Argentine Basin IMMA

## Description:

The Argentine Basin lies east of the Patagonian shelf between the latitudes of 38° and 50°S, and comprises a deep oceanic area (average depth ca. 5000 m) delimited by the Mid-Atlantic Ridge and the Scotia Basin to the east, the Rio Grande Rise to the north, the Patagonian continental slope to the west and the Falkland (Malvinas) Escarpment to the south.

The Argentine Basin is a complex system of water masses, with different circulation patterns. The upper level is under the influence of saline subtropical water from the Brazil Current in the north and the cold, relatively fresh water from the Falkland (Malvinas) current on the south. The two currents meet to form the Subtropical Convergence, which varies seasonally. In the winter, the Convergence moves north to middle latitudes of the South Atlantic while in the summer the Convergence is pushed further to the south toward higher latitudes. The Convergence is a highly dynamic environment with the presence of multiple eddies (Legeckis & Gordon, 1982; Piola & Matano, 2001). The intermediate level is characterized by the northward circulation of Antarctic Intermediate Water (AAIW), and deeper circulation is formed by northward Circumpolar Deep Water (CDW) and southward North Atlantic Deep Water (NADW). In the abyssal layer, cold and dense Antarctic Bottom Water (AABW), spreads northward, constrained by bottom topography. Waters of less than 4000 m depth flow anticyclonically with poleward flow, while the abyssal flow is cyclonic (Peterson & Withworth III, 1989; Smythe-Wright & Boswell, 1989; Fontella et al., 2021).

The IMMA encompasses important habitat for two marine mammal species, the southern right whale



## Area Size

1 749 716 km<sup>2</sup>

## Qualifying Species and Criteria

Southern right whales – *Eubalaena australis*  
Criterion C (2)

Southern elephant seal – *Mirounga leonina*  
Criterion C (2)

## Summary

The Argentine Basin IMMA is used as a foraging area by both southern right whale (*Eubalaena australis*) mothers and calves and adult southern elephant seal (*Mirounga leonina*) females. Both species have primary breeding grounds in the waters or coastal areas of Península Valdés (Argentina), and perform recurrent foraging trips to this IMMA. Although there is no direct overlap between the epipelagic foraging of whales and the deep diving of seals, the area is critically important for the survival of reproductive females of both species.



Figure 1: Southwest Atlantic right whale (*Eubalaena australis*) breaches. Photo credit: Alex Zerbini

(*Eubalaena australis*) and the southern elephant seal (*Mirounga leonina*). This habitat is primarily used by mothers with calves of southern right whales late in the spring and early in the summer, after the whales depart from their calving grounds in Península Valdés. Adult female elephant seals actively forage in this habitat during post-breeding and post-molting pelagic periods.

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

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

Satellite tracking information was used to infer habitat use of southern right whales (*Eubalaena australis*) and southern elephant seals (*Mirounga leonina*) (Zerbini et al., 2016, 2018, unpublished data; Campagna et al., 2021; McGovern et al., 2019). Southern right whales migrate from their calving grounds in the northern Patagonian gulfs, including

Golfo Nuevo near Península Valdés, Argentina, into the Patagonian shelf and the Argentine Basin. Animals moving into the basin comprise primarily females that were accompanied by a calf at the time of instrumentation. Movement models suggest that when they are in the basin these whales engage in area-restricted search behavior, which has been linked to feeding by marine vertebrates, including baleen whales (Jonsen et al., 2007; Bailey et al., 2009). This type of behaviour is frequently associated with cyclonic, cold-water eddies (Zerbini et al., 2016), where it is believed southern right whales forage on zooplankton at the epipelagic zone.

Male elephant seals from the population that originates in colonies on Península Valdés forage in shallow water along the continental shelf or slope. In contrast, most adult females forage in the deeper waters of the Argentine Basin (Campagna et al., 1999,



Figure 2: Southern elephant seals (*Mirounga leonina*) mother and pups. Photo credit: Kristin McGovern



Figure 3: A male southern elephant seal proboscis (*Mirounga leonina*). Photo credit: Kristin McGovern



Figure 4: Two fighting males of southern elephant seal (*Mirounga leonina*). Photo credit: Kristin McGovern

2007; Lewis et al., 2006; McGovern et al., 2019; Campagna et al., 2021), although some may forage over the continental shelf (Eder et al., 2019). Approximately 17% of recorded adult female foraging dives occurred on the continental shelf, while 80% occurred over the continental slope and Argentine Basin (McGovern et al., 2019). Fishes of the families Microstomatidae and Myctophidae (*Lampadena* sp.) were recorded as the main prey, and captures were mainly on the mesopelagic system, with prey encounter depth being significantly deeper during the day ( $603 \pm 202$  m) than during dusk, night, and dawn ( $462 \pm 193$ ,  $336 \pm 217$ , and  $327 \pm 201$  m, respectively). There was a clear association with deep water masses in the Argentine Basin, as females made most of their foraging dives (68%), and had the most prey encounters (67%) in Antarctic Intermediate Water followed by the Upper Circumpolar Deep Water, with 20% of dives and prey encounters (McGovern et al., 2021).

## Supporting Information

Bailey, H., Mate, B., Palacios, D., Irvine, L., Bograd, S. and Costa, D. 2009. Behavioural estimation of blue whale movements in the Northeast Pacific from state-space model analysis of satellite tracks. *Endangered Species Research* 10, 93-106.

Campagna, C., Fedak, M.A. and McConnell, B.J. 1999. Post-breeding distribution and diving behavior of adult male southern elephant seals from Patagonia. *Journal of Mammalogy*, 80(4), 1341-1352.

Campagna, C., Piola, A.R., Marin, M.R., Lewis, M., Zajaczkovski, U., and Fernández, T. 2007. Deep divers in shallow seas: Southern elephant seals on the Patagonian shelf. *Deep Sea Research Part I: Oceanographic Research Papers*, 54(10), 1792-1814.

Campagna, J., Lewis, M.N., González Carman, V.,

- Campagna, C., Guinet, C., Johnson, M., and Hindell, M.A. 2021. Ontogenetic niche partitioning in southern elephant seals from Argentine Patagonia. *Marine Mammal Science*, 37(2), 631-651.
- Eder, E.B., Lewis, M.N., Campagna, C., and Koch, P.L. 2010. Evidence of demersal foraging from stable isotope analysis of juvenile elephant seals from Patagonia. *Marine Mammal Science*, 26(2), 430-442.
- Fontela, M., Velo, A., Gilcoto, M., and Pérez, F.F. 2021. Anthropogenic CO<sub>2</sub> and ocean acidification in Argentine Basin Water Masses over almost five decades of observations. *Science of The Total Environment*, 779, 146570.
- Jonsen, I.D., Myers, R.A. and James, M.C. 2007. Identifying leatherback turtle foraging behaviour from satellite telemetry using a Switching State-Space Model. *Marine Ecology Progress Series* 337, 255-64.
- Legeckis, R. and Gordon, A.L. 1982. Satellite observations of the Brazil and Falkland currents—1975 1976 and 1978. *Deep Sea Research Part A. Oceanographic Research Papers*, 29(3), 375-401.
- Lewis, R., O'Connell, T.C., Lewis, M., Campagna, C., and Hoelzel, A.R. 2006. Sex-specific foraging strategies and resource partitioning in the southern elephant seal (*Mirounga leonina*). *Proceedings of the Royal Society B: Biological Sciences*, 273(1603), 2901-2907.
- McGovern, K.A., Rodríguez, D.H., Lewis, M.N., and Davis, R.W. 2019. Diving classification and behavior of free-ranging female southern elephant seals based on three-dimensional movements and video-recorded observations. *Marine Ecology Progress Series*, 620, 215-232.
- McGovern, K.A., Rodríguez, D.H., Lewis, M.N., Eder, E.B., Piola, A.R., and Davis, R.W. 2022. Habitat associations of post-breeding female southern elephant seals (*Mirounga leonina*) from Peninsula Valdés, Argentina. *Deep Sea Research Part I: Oceanographic Research Papers*, 185, 103789.
- Peterson, R.G. and Whitworth III, T. 1989. The Subantarctic and Polar Fronts in relation to deep water masses through the southwestern Atlantic. *Journal of Geophysical Research: Oceans*, 94(C8), 10817-10838.
- Piola, A.R., Matano, R.P., Steele, J.H., Thorpe, S.A., and Turekian, K.K. 2001. Brazil and Falklands (Malvinas) currents. *Ocean currents*, 35-43.
- Smythe-Wright, D. and Boswell, S. 1998. Abyssal circulation in the Argentine Basin. *Journal of Geophysical Research: Oceans*, 103(C8), 15845-15851.
- Zerbini, A.N., Rosenbaum, H., Mendez, M., Sucunza, F., Andriolo, A., Harris, G., Clapham, P.J., Sironi, M., Uhart, M. and Ajó, A.F. 2016. Tracking southern right whales through the southwest Atlantic: an update on movements, migratory routes and feeding destinations. Paper SC/66b/BRG26 presented to the IWC Scientific Committee, June 2016, Bled, Slovenia (unpublished), 16pp.
- Zerbini, A.N., Ajo, A.F., Andriolo, A., Clapham, P.J., Crespo, E., Gonzalez, R., Harris, G., Mendez, M., Rosenbaum, H., Sironi, M., Sucunza, F. and Uhart, M. 2018. Satellite tracking of Southern right whales (*Eubalaena australis*) from Golfo San Matías, Rio Negro Province, Argentina. Paper SC/67B/CMP/17 presented to the IWC Scientific Committee, Bled, Slovenia, 23 April-6 May 2018, 10pp.

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