Scotia Arc IMMA

Area Size

614,480 km²

Qualifying Species and Criteria

Southern right whale – *Eubalaena australis*
Criterion C2

Humpback whale – *Megaptera novaeangliae*
Criterion C2

Fin whale – *Balaenoptera physalus*
Criterion A

Antarctic blue whale – *Balaenoptera musculus intermedia*
Criterion A

Sei whale – *Balaenoptera borealis*
Criterion A

Sperm whale – *Physeter macrocephalus*
Criterion A

Criterion D (2) - Marine Mammal Diversity
Arctocephalus gazella, Balaenoptera bonaerensis, Balaenoptera borealis, Balaenoptera musculus intermedia, Balaenoptera physalus, Cephalorhynchus cruciger, Eubalaena australis, Globicephala melas, Hydrurga leptonyx, Hyperoodon planifrons, Leptonychotes weddellii, Megaptera novaeangliae, Mirounga leonina, Orcinus orca, Physeter macrocephalus

Summary

The Scotia Arc comprises South Georgia, South Sandwich, South Orkney and South Shetland Islands, which are all fragmented remnants of what once formed a land bridge between South America and the Antarctic Peninsula. Large colonies of seals and seabirds breed at South Georgia, and the region supports important commercial fisheries for krill and various species of fish. For more information on the seals that breed in this IMMA, please see the summary for the South Georgia IMMA: https://www.marinemammalhabitat.org/portfolio-item/south-georgia/

The region is dominated by the Antarctic circumpolar current, which transports nutrients and organisms, particularly krill, from the Antarctic Peninsula across the Scotia Sea to South Georgia. The area is known to serve as a rich seasonal feeding ground for Critically Endangered Antarctic blue whales (*Balaenoptera musculus intermedia*), Vulnerable fin whales (*B. physalus*), Endangered sei whales (*B. borealis*) and Vulnerable sperm whales (*Physeter macrocephalus*). The area surrounding South Georgia includes an important feeding ground for the southern right whale (*Eubalaena australis*) population that breeds off the coast of South America. Furthermore, the area northeast of South Georgia and the Sandwich Islands comprises an important foraging ground for humpback whales (*Megaptera novaeangliae*) from the population that breeds off the coast of Brazil.

Description

The islands of the Scotia Arc were formed by continental fragments that once formed a land bridge between South America and Antarctica. Despite the cold waters that flow around South Georgia and part of the Scotia Arc, the islands are rarely surrounded by pack ice. The region also imparts a strong seasonal influence on sea surface temperatures, fast-ice (frozen sea surface) formation and breakup, primary and secondary productivity and associated predators (mainly in summer season). The area is dominated by the Antarctic Circumpolar Current (ACC), which transports nutrients and organisms, particularly krill, from the Antarctic Peninsula across the Scotia Sea to the South Georgia region (Thorpe et al., 2007, Fielding et al., 2014), supporting a rich food web (Atkinson et

al., 2001; Reid et al., 2010) that includes zooplankton, large densities of krill and marine mammals. Zooplankton biomass is also high near the island, with values roughly 4 to 5 times higher than those more typical of the Southern Ocean. Large colonies of seals and seabirds breed at South Georgia, and the region supports important commercial fisheries for krill and various species of fish (Atkinson et al., 2001; 2008).

Figure 1: An Antarctic minke whale in the Scotia Arc IMMA. Photo: Jorge Acevedo.

Criterion A: Species or Population Vulnerability

Antarctic blue whales are estimated to be at less than 2% of their pre-whaling abundance, and the population is classified as "Critically Endangered" in the IUCN Red List (Cooke et al., 2018). Both fin and sei whales are estimated to be at about 25% of their pre-exploitation levels in the Southern Hemisphere, and the species are considered "Vulnerable" and "Endangered", respectively (Cooke et al., 2018). Catches of blue whales in the Antarctic began from land stations on South Georgia in 1904 and peaked at over 30,000 per year in the 1931/32 season (Allison, 2017), with the total historical kill of approximately 350,000 animals. An estimate of their numbers from Japanese surveys covering just half of the Antarctic (35°E to 145°W) south of 60° S is only 1,223 individuals (CV 0.35) in 2008 (Matsuoka and Hakamada, 2014). Over 725,000 recorded fin whale kills have been occurred in the Southern Hemisphere during 1905-76 (Allison, 2017). For fin whales, the current circumpolar abundance remains highly uncertain until all existing data are analysed and more data are collected from the zone 50°- 60°S. However, Viquerat and Herr (2017) estimated abundances of about 500 and 800 fin whales around Elephant Island and the South Orkneys, respectively.

Over 200,000 sei whales were reportedly killed by modern whaling in the Southern Hemisphere during 1905–1979 (Allison 2017), and the last stock assessments of sei whales conducted by the IWC Scientific Committee were in 1979 for the Southern Hemisphere (IWC 1980). Today, in the absence of dedicated surveys and corresponding abundance estimates, it is not possible to verify whether there has been any increase in Southern Hemisphere sei whales since the cessation of whaling. Nevertheless, while the available data do not permit a scientifically rigorous estimation of the extent of population reduction, a conventional population assessment model was used to provide an illustration of the extent of possible reduction, and fitted population sizes for those aged 1+ were 10,000 sei whales in 1983 in the Southern Hemisphere (Cooke et al., 2018). Antarctic blue, fin, and sei whales have been protected in the Southern Hemisphere since 1976, thus the direct exploitation threat is part of the past. However, a new threat for these species in Antarctica might be food availability in a near future. Scotia Arc waters is an important foraging ground for these species. The main food of these baleen whales in the Southern Ocean, *Euphausia superba* and *E. crystallorophias*, are predicted to decline during the 21st century due both to reduced ocean productivity associated with warming (Piñones and Fedorov, 2016) and to increasing ocean acidity that limits their shell-building (Kawaguchi et al., 2013).

The sperm whale, classified as "Vulnerable" on the IUCN Red List, was commercially hunted at a large scale in the Antarctic region, with the population of mature and maturing males in the Antarctic heavily whaled between 1950-1980 (Taylor et al., 2008). The expected rate of increase for exploited populations of sperm whales was estimated to be approximately 1.1% per year (Whitehead, 2002). Systematic surveys of sperm whales in the Antarctic showed no substantial or statistically significant increase between 1978 and 1992 (Branch and Butterworth, 2001). Yet, heavily exploited populations of sperm whales in the Southern Hemisphere have shown little evidence of population increase decades after

the end of their commercial hunting (Carroll et al., 2014). Sperm whales have been reported to depredate Patagonian toothfish (*Dissostichus eleginoides*) from long-lines in sub-Antarctic and Antarctic regions, and it appears to be an increasing phenomenon occurring in South Georgia and several other Southern Ocean island areas (Purves et al., 2004; Guinet et al., 2015; Janc et al., 2018). This interaction has resulted in entanglements and deaths (Hucke-Gaete et al., 2004) and has incurred hostility from some fishermen (Donoghue et al., 2003; González and Olavarria 2002,; Guinet et al., 2015).

Figure 2: A fin whale surfacing in the Scotia Arc IMMA. Photo: Manuela Bassoi

Criterion C: Key Life Cycle Activities Sub-criterion C2: Feeding Areas

The area includes an important feeding ground for southern right whales travelling there from their breeding grounds off the coast of Argentina, Uruguay and Brazil (Best et al., 1993; Rowntree et al., 2001; Ott et al., 2011; IWC 2012; Nijs and Rowntree, 2017). The IWC divided the Southern Hemisphere into 11 management units for Southern right whales based on the distribution patterns and locations of breeding aggregations (IWC, 2001). One of these units corresponded to breeding grounds off Peninsula Valdés, Argentina, which has the largest aggregations of Southern right whales in the western South Atlantic Ocean (IWC, 2001). Valenzuela et al. (2011), assessing genetic differentiation on Southern right whale calving and feeding grounds, confirmed the lack of differentiation between Peninsula Valdés, (Argentina) and the feeding ground off South Georgia (IWC 2012), supporting that South Georgia is an important feeding destination for Southern right whales wintering off Peninsula Valdés. Moreover, recent studies using satellite tags have confirmed feeding areas surrounding South Georgia for Southern right whales tagged in Argentina (Zerbini et al., 2016; 2018). Additionally, the occurrence of southern right whales around South Georgia has been well documented from early 20th century and the 1960s whaling (Tormosov et al., 1998; IWC 2001) as well as sighting data (Moore et al., 1999; Richardson et al., 2012; IWC SOWER Cruises).

The wintering ground of humpback whales from IWC management stock A is the Southwest Atlantic (coast of Brazil), while the waters around South Georgia and the South Sandwich Islands are an important foraging ground for humpback whales from this stock (Zerbini et al., 2006; 2011). Photo-identification, genetic, and old Discovery mark data also support the fact that animals from IWC breeding stock A (Brazil) often feed off South Georgia and the South Sandwich Islands (Zerbini et al., 2006; 2011; Engel et al., 2008; Fleming and Jackson, 2011; Jackson et al., 2015).

Figure 3: A humpback whale fluking in the Scotia Arc IMMA. Photo: Jorge Acevedo.

Criterion D: Special Attributes Sub-criterion D2: Diversity

Many cetacean species have been recorded in the northwest parts of the Scotia Arc. Historical catch records, transect surveys, opportunistic sightings, and tracking data all document the presence of baleen whales around the islands (Mizroch et al., 1985; Moore et al., 1999; Richardson et al., 2012; Ropert-Coudert et al., 2014; 2018; IWC SOWER Cruises; OBIS 2018). Records of catches at South Georgia (1904 to 1965)

Figure 4: A leopard seal resting in the Scotia Arc IMMA. Photo: Jorge Acevedo.

included blue whale, fin whale, sei whale, humpback whale, Antarctic minke whale, southern right whale and sperm whale in great numbers and , and most species were depleted to <10% of their original stock size (Clapham and Baker 2009). Large whale species that were depleted during the whaling era at South Georgia are recovering, but at variable rates (Richardson et al., 2012). No data sources suggest major concentrations of baleen whales, but the area still supports many marine mammal species and the high densities of krill undoubtedly are an attractant for marine mammals. From recent studies analysing opportunistic sightings from 1992 to 2001, the four most commonly reported species around South Georgia were southern right whales, humpback whales, Antarctic minke whales and killer whales (Richardson et al., 2012). Other species seen around South Georgia, western and southeast of the islands include Antarctic blue whales, fin whales, hourglass dolphins, long-finned pilot whales, sei whales, sperm whales, and Southern bottlenose whales (Mizroch et al., 1985; Moore et al., 1999; Richardson et al., 2012; Ropert-Coudert et al., 2014; 2018; IWC SOWER Cruises; OBIS 2018). South Georgia island is the main breeding area for the Antarctic fur seal (Reijnders et al., 1993, Wynen et al., 2000; SCAR EGS 2008); a small population of Weddell seals live there all year (Southwell et al., 2012), and more than 50% of Southern elephant seal pup production takes place at South Georgia (Boyd et al., 1996; M. Fedak pers. comm. in SCAR; EGS, 2008). Leopard seal births at South Georgia occur from late August to the middle of September (Southwell et al., 2012; Jessopp et al., 2004).

Supporting Information

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