THE SOUTH ATLANTIC: A SANCTUARY FOR WHALES

Presented by the
Governments of Argentina, Brazil and South Africa
to the 57th Annual Meeting of the International Whaling Commission

Ulsan, Republic of Korea

June 2005

Nothing in this document is intended to imply any restrictions to the sovereign rights of coastal States as established in the United Nations Convention of the Law of the Sea

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1. INTRODUCTION AND BACKGROUND

At the 50th Meeting of the International Whaling Commission, held in the Sultanate of Oman in 1998, Brazil stated its intention to propose the establishment of a Whale Sanctuary in the South Atlantic Ocean. Since that meeting, many consultations have been held in order to ensure that the proposed Sanctuary would be socially, economically and scientifically useful for the peoples of the South Atlantic coastal States and would contemplate the widest possible array of regional interests. A proposal for a Whale Sanctuary in the South Atlantic was then submitted by the Governments of Brazil and Argentina, with the support of South Africa together with many co-sponsors, to the 53rd, 54th, 55th and 56th meetings of the IWC (held respectively in Hammersmith, United Kingdom in 2001; Shimonoseki, Japan in 2002; Berlin, Germany in 2003; and Sorrento, Italy in 2004), achieving in all meetings a majority of votes in favor of the proposal. This document is a revised version of this proposal and summarizes the arguments that support the establishment of the Sanctuary (hereafter referred to as the "South Atlantic Whale Sanctuary" - SAWS). This proposal has been revised in May 2005 to take account of comments that were made by member Governments and within the IWC Scientific Committee, as well as by many independent scientists and natural resource managers from within the region.

Article V of the International Convention for the Regulation of Whaling (ICRW) contains provisions under which the International Whaling Commission (IWC) may amend the Schedule by adopting regulations with respect to the conservation and use of whales and whale products, including the designation of sanctuary areas. These areas may be used for a variety of purposes in particular those regarding whale research, management and conservation.

Up to the present, the IWC has adopted three whale sanctuaries, two of which are still in force. In 1948, at its first meeting, the Commission suggested that parts of the IWC management areas I and VI designated in 1938 as a sanctuary by the International Whaling Conference in London should maintain such status. The so-called "Sanctuary" had the purpose of protecting whales in part of their Antarctic feeding grounds, which had not previously been subjected to pelagic whaling. Its boundaries encompassed the Southern Ocean south of 40ºS between 70ºW and 160ºW. The Sanctuary was maintained until 1955.

In 1979, at the 31st IWC Annual Meeting, the Republic of Seychelles proposed the establishment of a sanctuary in the Indian Ocean. It became effective the same year and was established initially for a period of ten years. The Indian Ocean Sanctuary was renewed in 1989 for another three years and indefinitely in 1992, and was subject to further review in 2002, when a proposal to abolish it was rejected by the Commission, and it therefore remains in force for an indefinite period of time. It comprises the waters of the Northern Hemisphere from the coast of Africa – including the Red and Arabian Seas and the Gulf of Oman – to 100ºE; and the waters of the Southern Hemisphere north of 40º S from 20ºE to 130ºE.

A third whale sanctuary was proposed by the French Government at the IWC 44th Annual Meeting in 1992, encompassing the waters of the Antarctic Ocean south to the Antarctic Convergence. It was named "The Southern Ocean Sanctuary" and was adopted by the Commission at its 46th Annual Meeting in 1994. This sanctuary will be reviewed at succeeding ten year intervals and comprises effectively the waters of the Southern Hemisphere from 40ºS, 50ºW eastward to 20ºE, then southward to 55ºS, eastward 130ºE, northward to 40ºS, eastward to 130ºW, southward again to 60ºS, eastward to 50ºW and finally northward to the initial point.

The South Atlantic Ocean has been the scene of the reckless slaughter of most of the species of large whales, not only by coastal whaling that goes back to the early settlement times, but in more recent decades by pelagic fleets foreign to the region and largely detached from the South Atlantic nations´ legitimate interests in the management of whale resources. Some of these fleets have consistently captured protected species and disregarded regulations set forth by the IWC itself, therefore imposing further damage on species and stocks and preventing until today an adequate evaluation of the impacts of pelagic whaling in the regional context.

The proposition of a Sanctuary in the South Atlantic wishes to reassert such conservation interests in the light of the growing and highly qualified regional contribution towards research and the undeniable economic interest of many developing countries in the development of sustainable non-lethal uses of whales, particularly whale watching. This industry constitutes an entirely viable use of whale resources, in urgent need of sounder scientific basis for its management.

It is to be noted that South American scientists have stressed the importance of extending the protection of marine mammals in especially designated sanctuary areas, in particular those declared offshore to encompass significant portions of the ocean basin[1,2] .

Since the inception of the International Convention for the Regulation of Whaling in 1946, world perspective on conservation and proper management of natural resources in general, and marine resources in particular, has evolved dramatically. In particular, during the past two decades, a number of international conventions have included new obligations for management activities regulating uses of the oceans[3]. It is therefore a *sine qua non* condition for the proper management of whales that these developments be taken into account.

The United Nations Convention on the Law of the Sea was opened for signature in 1982 and entered into force in 1994. This regime deals with all matters related to oceans and seas, and provides rules for the regulation of all uses of oceans and seas. UNCLOS also establishes a framework for the development of conservation and management measures concerning marine resources and scientific research within the Exclusive Economic Zone (EEZ) of a State, as well as on the high seas.

Part 12 of UNCLOS outlines provisions for the protection and preservation of marine ecosystems. These provisions are applicable to fisheries industries on a global scale. All States are obliged to undertake measures to protect the marine environment and to control, reduce and manage pollution of the sea (Articles 192 & 194). The provisions relating to the protection and preservation of the marine environment emphasize the importance of cooperation between States and the need for States to undertake surveillance of activities that they permit or engage in, in order to determine whether these activities are likely to have significant adverse impacts on the marine ecosystem and its various components (Article 204(2)).

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[1] Batallés, L.M. 2000. Áreas marinas protegidas como parte de uma estrategia de conservación de los Mamíferos Marinos. *Resúmenes 9ª Reunión de Trabajo de Especialistas em Mamíferos Acuáticos de América del Sur*, Buenos Aires, p. 11.

[2] Campagna, C. 2000. Parques de cielo y agua. *Resúmenes 9ª Reunión de Trabajo de Especialistas em Mamíferos Acuáticos de América del Sur*, Buenos Aires, pp. 19-20.

[3] Aqorau, T. 2001. Obligations to protect marine ecosystems under international conventions and other legal instruments. Paper presented at the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem. Reykjavik, Iceland, 1-4 October 2001, 11p.

Parties are required to establish measures for the conservation and management of marine living resources in their EEZs. These measures must take into account *inter alia* the effects of harvesting target species on species that are associated with or dependent upon the harvested species whilst ensuring that living resources are not endangered by overexploitation (Article 61(2) & (4). Additionally, UNCLOS addresses highly migratory species, marine mammals, and anadromous and catadromous stocks to ensure that these species are conserved and managed in their State of origin and external areas (Articles 64-67). In reference to marine mammals, the special status of these animals is explicitly recognized by the provisions of Article 65, reasserting the right of coastal States to adopt strict conservation measures in relation to their management.

All States are obliged to undertake measures to conserve the living resources of the high seas and, in doing so, States must cooperate with each other and establish regional or sub-regional coordination as appropriate to promote this objective.

The Convention on Biological Diversity (CBD) was signed on 5 June 1992 in Rio de Janeiro, Brazil, and entered into force on 23 December 1993. It was created to provide an international framework for the conservation and ecologically sustainable development and use of biodiversity. The Convention applies to all terrestrial and marine biodiversity, and outlines measures for conserving biodiversity as obligations of all Parties. General measures for conserving biodiversity and ensuring ecologically sustainable development include developing national policies, strategies and programmes that should *inter alia* reflect the principles espoused in the Convention (Article 6(a)). The Convention also urges Parties to integrate biodiversity conservation policies and strategies with cross-sectoral plans (Article 6(b)).

Measures outlined for the *in situ* conservation of biodiversity encompass certain key issues. These include *inter alia* protected areas, ecosystems and habitats. With respect to protected areas and ecosystems, the Convention imposes *inter alia* the following obligations on all Contracting Parties[4]:

- establish a system of protected areas for conserving biodiversity;
- develop guidelines for the selection, establishment and maintenance of protected areas;
- regulate and manage biological resources that are important for conserving biodiversity within protected areas and in ex situ circumstances;
- *Promote ecologically sustainable development in areas adjacent to protected areas with a view to protecting these areas and to complement protected areas*; (emphasis added)
- rehabilitate and restore degraded ecosystems, *inter alia* through the development and implementation of management plans and strategies; and
- promote *in situ* protection of ecosystems, natural habitats and the maintenance of viable populations of species.

Parties are required to regulate and manage threatening processes affecting or likely to affect biodiversity in an adverse manner (Article 8(l)).

Still in relation to the CBD, the *Jakarta Ministerial Statement on the Implementation of the Convention on Biological Diversity* (Jakarta Mandate on Coastal and Marine Biodiversity) was issued during the second meeting of the Conference of the Parties (COP) to the CBD,

[4] Aqorau, T., *op. cit.*

held in Jakarta in November 1995, as a result of the COP identifying marine and coastal biodiversity as a high priority issue. The Mandate essentially reaffirms the importance of the conservation and ecologically sustainable use of coastal and marine biodiversity and urges the COP to initiate the immediate development and implementation of actions concerning this issue. The Mandate specifically links conservation, the use of biodiversity and fishing activities, and establishes a new global consensus on the importance of marine and coastal biodiversity[5].

At the 7th meeting of the parties to the Convention on Migratory Species (CMS) in 2002, fin, sei and sperm whales were listed on Appendix I and II, and the Antarctic minke, Bryde's and pygmy right whales on Appendix II of the Convention. These listings indicate that CMS has also identified a need to give greater protection for these six species and their habitats, breeding grounds and migration routes[6].

It is important to note that the view that international instruments such as the ICRW must be interpreted and applied within the framework of the entire legal system prevailing at the time of its interpretation is supported *inter alia* by cases brought forward at the International Court of Justice[7], which already in 1997 referred to the existence of a duty on States to take into account newly evolving environmental principles when applying existing international instruments[8].

[5] Aqorau, T. op. cit.
[6] Government of Australia. 2002. Proposal to include species in the Appendices of the Convention on Migratory Species. Inclusión of *Balaenoptera edeni* in Appendices I y II. CMS Proposal I/2 and II/2. 11pp.
[7] *Advisory Opinion on the Legal Consequences for States of the Continued Presence of South Africa in Namibia*, [1971] *I.C.J. Reports*, paragraph 31.
[8] *Gabcikovo-Nagymaros Project Case*, [1997] *I.C.J. Reports*, paragraph 140.

2. THE SOUTH ATLANTIC OCEAN: A BRIEF OVERVIEW

The South Atlantic is a dynamic system, where vital parts of biological cycles of many species of whales take place. These cycles are greatly determined by major oceanographic features present in the ocean basin.

The Benguela System is the dominant oceanographic feature on the West Coast of South Africa. It can be classified as the eastern boundary current of the South Atlantic Ocean, and is typified by cool surface waters and high biological productivity. The latter is the consequence of wind-induced upwelling, in which the prevailing southerly winds drive surface water northwards and away from the coast so that cooler water rises from the depths to replace it. This deeper water is rich in nutrients, which, when exposed to the sunlight provide ideal conditions for the growth of phytoplankton. This in turn forms the basis for zooplankton blooms, shoals of fish and abundant predators. The rate of upwelling is not uniform along the whole West Coast, and two of the areas of maximum upwelling occur in the vicinity of Cape Town. The first is the western seaboard of the Cape Peninsula and the second is Cape Columbine, the western-most headland along much of the Western Cape coast. From these centers of upwelling, tongues of cold water extend northwards and westwards, creating preferred habitats for a number of marine species[9].

The Angola Current forms the eastern section of a large, cyclonic gyre in the Gulf of Guinea. In the upper layer (0-100 m), it seems to be formed mainly by the southeast branch of the South Equatorial Countercurrent and the southward-turning waters from the north branch of the Benguela Current. The influx of waters originating north of the equator is only moderate. However, in layers deeper than 100 m, northern waters become more important in feeding the Angola Current. The current is a fast, narrow, and stable flow that reaches 250-300 m depths and covers both the shelf regions and the continental slope, and shows marked temporal variation[10]. At approximately 15°S, the southward-flowing Angola Current converges with the northward-flowing Benguela Current to form the Angola-Benguela Front (ABF)[11]. The ABF demarcates the warm, nutrient-poor Angola Current water and the cold, nutrient-rich Benguela Current water, creating a transition zone between the tropical ecosystem in the north and the upwelling-driven ecosystem in the south[12]. It is typically characterized at the surface by a temperature gradient reaching 4°C per 1° latitude.

The South Equatorial Current (SEC) is a broad, westward flowing current that extends from the surface to a nominal depth of 100 m. Its northern boundary is usually near 4°N, while the southern boundary is usually found between 15-25°S, depending primarily on longitudinal location and the time of the year. The relatively cool Benguela Current flows northward to feed the southern branch of the SEC. The SEC flows westward toward the Brazilian shelf, and splits at the São Roque Cape, near 16°S with one branch, the stronger of the two, heading northwards as the North Brazil Current (NBC) and the other, weaker southwards branch, as the Brazil Current. Some of the NBC waters retroflect and feed the North Equatorial Counter Current, which in turn, helps feeds the northern branch of the SEC. It divides seasonally near

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[9] Shannon, L.V. 1985. The Benguela Ecosystem, I., Evolution of the Benguela, physical features and processes. *Oceanography and Marine Biology*, **23**, 105-182.

[10] Moroshkin, K.V., V.A. Bunov, and R.P Bulatov, 1970. Water circulation in the eastern South Atlantic Ocean. *Oceanology*, **10**, 27-34.

[11] Meeuwis, J.M. and J.R.E. Lutjeharms, 1990. Surface thermal characteristics of the Angola-Benguela front. *South African Journal of Marine Science*, **9**, 261-279.

[12] Lass, H.U., M. Schmidt, V. Mohrholz, and G. Nausch, 2000: Hydrographic and current measurements in the area of the Angola-Benguela front. *Journal of Physical Oceanography*, **30**, 2589-2609.

the eastern tip of Brazil where residual alongshore velocities are northward for half the year (peaking during May and June) and southward for the other half of the year[13].

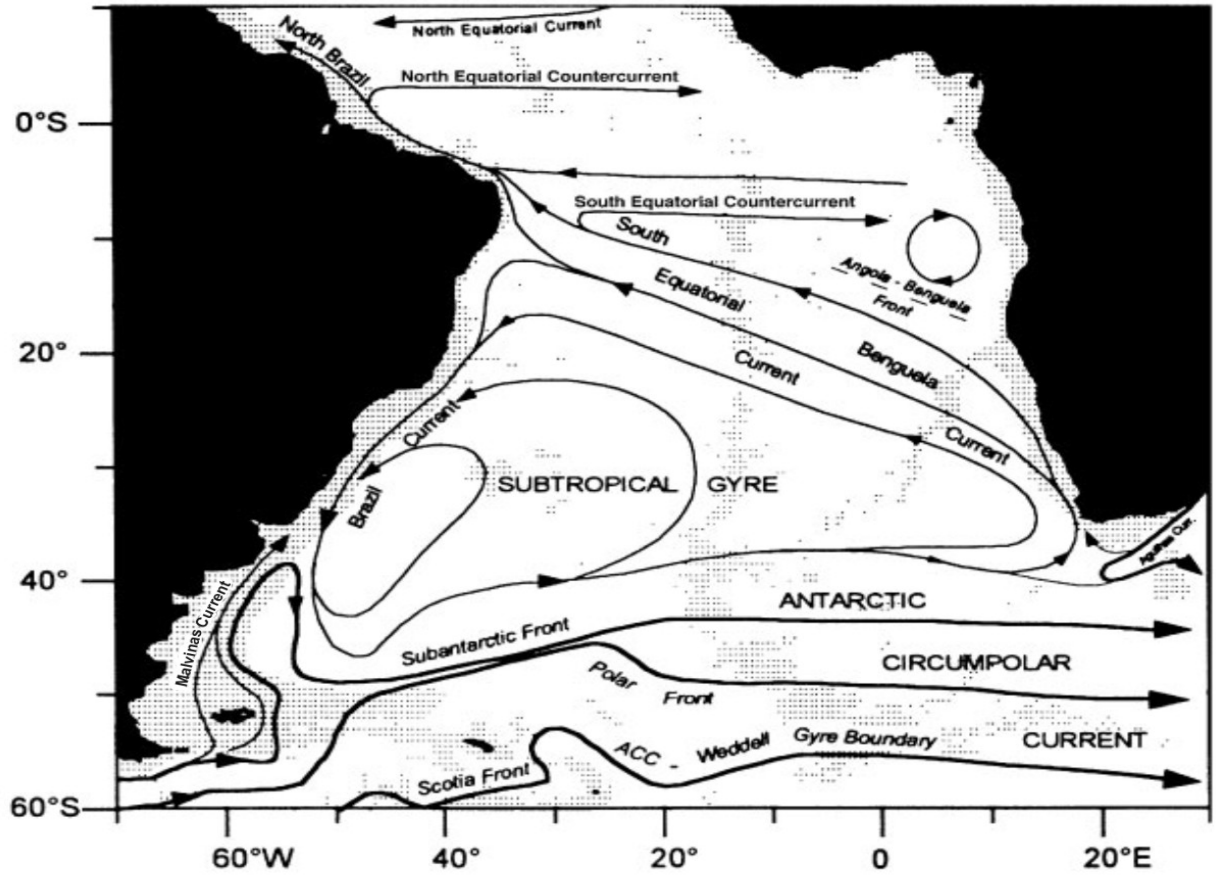

Figure 1. Major currents influencing ecological processes and biodiversity in the South Atlantic Ocean

The Brazil Current is a western boundary current carrying warm subtropical water, which runs south along the coast of Brazil from about 9°S to about 38°S and is generally confined to the upper 600m of the water column[14]. It separates slightly from the coast near 12°S where the continental shelf becomes wider. At about 20° 30'S, the current encounters the Vitória-Trindade Ridge, a zonal seamount chain where it has been observed to flow through the inshore passage rather than the passages farther east. In this region, a cyclonic gyre seaward of the Brazil Current, centered at about 17°S and 34°W has been observed and attributed to the southernmost meanders of the South Equatorial Current that are reflected northward by this same seamount chain[15].

The Malvinas (Falkland) Current is a branch of the Circumpolar Current and flows northward along the continental shelf of Argentina until it reaches the Brazil Current offshore and north

[13] Bourles, B., Y. Gouriou and R. Chuchla, 1999: On the circulation in the upper layer of the western Equatorial Atlantic, *Journal of Geophysical Research*, **104**, 21151-21170.

[14] Stramma, L., Y. Ikeda, R.G. Peterson, 1990: Geostrophic transport in the Brazil Current region north of 20°S. *Deep-Sea Research*, **37** (12), 1875-1886.

[15] Memery, L., M. Arhan, X.A. Alvarez-Salgado, M-J. Messias, H. Mercier, C.G. Castro, A.F. Rios, 2000: The water masses along the western boundary of the south and equatorial Atlantic. *Progress in Oceanography*, **47**, 69-98.

of the La Plata River estuary[16]. The combined flow of the two currents causes a strong thermohaline frontal region, called the Brazil-Malvinas Confluence (BMC) in which the Brazil Current breaks off into two branches, one turning to the north forming a recirculation cell, while the other continues southward and veers northeast at about 45°S, becoming the South Atlantic Current[17]. Mean conditions of circulation vary significantly, and more recent evidence shows that it is likely related to meteorological anomalies[18].

While a detailed biogeographic description of the South Atlantic is beyond the scope of this document, it is worth noting that the Biogeography of the South Atlantic Ocean is highly influenced by these major currents (and therefore the definition of its ten recognized biogeographic zones is intimately related to them)[19] and so is the distribution of cetacean species; however, knowledge about the reasons for some habitat preferences (eg in some coastal breeding sites of migratory species) is still lacking.

[16] Legeckis, R. and A. Gordon, 1982. Satellite observations of the Brazil and Falkland Currents - 1975 to 1976 and 1978. *Deep-Sea Research*, **29**, 375-401.
[17] Saraceno, M., C. Provost, A.R. Piola, J. Bava, and A. Gagliardini. 2004. Brazil Malvinas Frontal System as seen from 9 years of advanced very high resolution radiometer data. *Journal of Geophysical Research*, **109** (C5)
[18] Assireu, A.T., M.R. Stevenson, J.L. Stech, 2003: Surface circulation and kinetic energy in the SW Atlantic obtained by drifters. *Continental Shelf Research*, **23**, 145-157.
[19] Kelleher, G., Bleakley, C. and S. Wells (eds). 1995. *A Global Representative System of Marine Protected Areas, Vol. I.* Great Barrier Reef Marine Park Authority.

3. WHALES AND WHALING IN THE SOUTH ATLANTIC OCEAN

The proposed South Atlantic Whale Sanctuary contains examples of:

i) Populations which are depleted but known to be recovering, e.g. southern right whale, humpback whale;
ii) Populations which are depleted where the current trend is unknown, e.g. fin and sei whale;
iii) Populations which are depleted where there is evidence that little recovery has taken place e.g. the stock of blue whales that utilized the S. Georgia area[20] and those killed off northeastern Brazil until the 1960´s;
iv) Populations such as Antarctic minke whales, for which very little recent data exist, and for which there are no current population estimates and trends agreed by the Scientific Committee; these remain under assessment;
v) Populations whose current trends and sizes are absolutely unknown, e.g. pygmy right whale, all the beaked whales, and several dolphins.

The proposed Sanctuary would give complete protection from commercial whaling to populations in all of the five categories listed above.

All large whale species, with the exception of pygmy right whales, were exploited by commercial whaling in the South Atlantic Ocean. They were captured in both feeding and breeding grounds. Each whale species suffered different degrees of exploitation and some were severely depleted. In the XVII – XIX centuries, right, humpback and sperm whales were captured by early whalers in the eastern South American and the southwestern African coasts[21]. The faster species - blue, fin, sei, Bryde's and minke whales - became available to whaling after the introduction of modern whaling techniques (e.g. the harpoon gun, steam-powered vessels).

In the Antarctic (feeding grounds), whales were taken and processed by both shore based stations established in Subantarctic islands as well as factory ships, while in tropical to temperate waters (breeding areas) they were primarily processed in land stations, though some factory ships did operate in the area. Main continental whaling stations operating around the South Atlantic were, in South America, Cabo Frio and Costinha in Brazil, both Brazilian-Japanese enterprises; and, in Africa, Cap Lopez in Gabon; Lobito, Elephant Bay, Mossamedes, Porto Alexandre and Baía dos Tigres in Angola; Walvis Bay and Luderitz in Namibia; Saldanha Bay (Donkergat and Salamander) and Hangklip in South Africa.

In Antarctic waters, the main species killed were blue, fin, sei, humpback and minke whales. In the tropical/subtropical whaling (and breeding) grounds off the western African and the eastern South American coasts the species taken were right, blue, fin, humpback, sei, Bryde's, minke and sperm whales.

It is worth noting that the South Atlantic was a region which was intensely targeted by 'pirate' or illegal whaling; its most blatant example is possibly the slaughter of endangered Southern right whales by pelagic fleets which continued until the 1970's, causing significant damage to the recovery of this species[22]. Between 1960/61 and 1967/68, within the proposed

[20] Moore, M. J., Berrow, S. D., Jensen, B. A., Carr, P., Sears, R., Rowntree, V., Payne, R. and Hamilton, P. K. 1999. Relative abundance of large whales around South Georgia (1979 - 1998). *Marine Mammal Science* 15(4): 1287-1302.
[21] Townsend, C.H., 1935. The distribution of certain whales as shown by logbook records of American whaleships. *Zoologica, New York:* 1-50.
[22] Center for Russian Environmental Policy. 1995. Soviet Antarctic Whaling Data (1947-1972). Moscow.

sanctuary, around 1300 southern right whales were killed by Soviet fleets off the coast of South America, and around 330 in the Southeast Atlantic north of 40°S[23]. Other large whales were also subject to excessive and unreported catches by the same fleets, and the extent of the damage to species/stocks and implications for the future of these stocks in the South Atlantic are still under scrutiny.

The effects of coastal whaling in parts of the South Atlantic, as already noted, are also largely unaccounted for; and in Brazil at least Southern right and humpback whales were killed in numbers as yet undetermined in the 20th century by coastal whaling station which, albeit artisanal in scale, may have inflicted severe damage to breeding populations. It is also known that shore stations preyed upon right whales in Uruguay, and similarly there is scarce data uncovered so far to account for the true scale of such operations.

Cetacean Species in the South Atlantic: Status of Current Knowledge

No less than 54 species of cetaceans inhabit the waters of the South Atlantic Ocean. Seven of these (the blue, fin, sei, common minke, Antarctic minke, humpback and right whales) are highly migratory baleen whales that feed in the Antarctic and Subantarctic oceans during summer and breed in tropical, subtropical and temperate waters in winter and spring. Two of these species, the Bryde's and the pygmy right whales, present a more limited distribution and a less marked migratory pattern. The former inhabits only tropical and subtropical waters as south as 40º S and the latter lives only in temperate waters between approximately 30º S and 50º S. Different forms of Bryde's whales have been identified in inshore and offshore waters and there is evidence that populations in the Atlantic Ocean belong to a different stock from the ones in the South Pacific and Indian Oceans. The sperm whale, a member of the toothed whale suborder, inhabits pelagic waters from tropical to polar environments. Breeding herds are restricted to tropical/subtropical waters north of 40ºS but mature males may migrate closer to the Antarctic continent. Sperm whales are also found in the South Atlantic Ocean basin, as well as many other smaller whale species. There are also many smaller-sized species whose distribution encompasses international waters and others with largely unknown offshore distribution but which seems very likely due to their biological characteristics. An Annex to this document presents a list of all cetacean species inhabiting the proposed South Atlantic Whale Sanctuary and what is currently known about their distribution and population status.

[23] Tormosov, D. D., Mikhaliev, Y. A., Best, P. B., Zemsky, V. A., Sekiguchi, K. and Brownell, R. L. 1998. Soviet catches of southern right whales Eubalaena australis 1951-1971. Biological data and conservation implications. *Biological Conservation* 86: 185-197.

4. PRESENT AND POTENTIAL THREATS TO WHALE STOCKS AND THEIR HABITATS WITHIN THE PROPOSED SANCTUARY

It is generally accepted that IWC-established whale sanctuaries have been mainly directed at preventing direct takes of whales in a given geographical area. However, in line with the expanding scope of the IWC agenda to address whale conservation and management issues beyond the decisions on lethal takes, it is proposed that the SAWS should have among its objectives the coordination of regional efforts to ensure the recovery of cetacean resources and its non-lethal appropriation by coastal States. Through regional cooperation and coordination, both at scientific and natural resource management levels, the SAWS can contribute to assess and, taking fully into account the sovereign actions and rights of coastal States, address cetacean conservation issues on a broader context. This section outlines some issues that are regionally important to consider for the adequate conservation of cetacean species and which can be tackled by a cooperative effort within the SAWS.

Contaminants

Two major sources of contaminants are more relevant to the South Atlantic: runoff and sewage from human settlements and inland activities, and offshore mineral exploitation. Pollution from coastal and inland sources includes a vast array of potentially harmful substances which can impact cetaceans directly or through the degradation of important coastal breeding/feeding areas. The offshore extraction of marine minerals can cause several environmental impacts to the marine ecosystems, being the habitat destruction the main factor affecting the decline of the number of species around the world. Besides direct interference on the sea-bottom, the marine mineral activities can cause an increase in the water turbidity, affecting the local primary production. These activities can introduce and promote nutrient availability causing eutrophication. Otherwise it can introduce toxic substances that may be incorporated by the organisms, causing growth changes and alterations on the rates of reproduction and survival of the species. Current methods to identify the environmental impacts associated with the offshore mineral exploitation are centered on the reconnaissance of pollutant introduction and bio-availability, on the verification of measurable environmental changes and on the establishment of the relationship among the environmental response and pollutants[24].

In Western Africa, because of the persistent lack of detailed scientific data on coastal, marine and freshwater environments, a certain degree of uncertainty prevails in assessing the pollution loads in general. The United Nations Environment Programme (UNEP) identified there an urgent need for more precise qualitative and quantitative assessment of the significant sources of land-based pollution[25]. Nevertheless, relevant information does exist which can be mentioned in the context of potential threats to cetacean conservation. Over-exploitation and impacts from the land-based settlements and activities in terms of industrial, agricultural, urban and domestic sewage run-off and other mining activities such as oil and gas are of particular concern along the coasts of Angola and Gabon.

[24] Gomes, A.S.; Palma, J.J.C. and Silva, C.G. 2000. Causas e conseqüências do impacto ambiental da exploração dos recursos minerais marinhos. *Revista Brasileira de Geofísica*, 18(3):447-54.

[25] UNEP. 1999. Regional Overview of Land-based Sources and Activities Affecting the Coastal and Associated Freshwater Environment in the West and Central African Region. UNEP/ GPA Co-ordination Office & West and Central Africa Action Plan, Regional Co-ordinating Unit. 110 pp.

Between Mauritania and Namibia, along the Atlantic coast, more than 46 million inhabitants occupy a narrow coastal margin some 60 km wide[26]. The highest population density centres are located in some key cities along the coast. These high population concentrations could explain the rapid population growth rate and the migration movements between rural and urban areas, which result in an increase of the mean urban population growth and a rapid expansion of the coastal populations, which in this region represents an average of more than 25 per cent of the countries' population.

In *South Africa* it is estimated that over 12 million people live within 60km of the coast, which constitutes little less than thirty percent of the country´s population. In the Western and Eastern Cape Provinces approximately eighty percent of the population resides in the narrow coastal strip. Development and other pressures on the coast have recently increased dramatically, and it is expected that this trend will continue. Since 1965, fourteen major deep sea outfalls have been constructed in South Africa, which discharge industrial and sewage waste water in excess of 600,000 m^3 per day. There are also a number of outfalls with shorter pipelines along the coast, some discharging within the surf zone. In total, marine outfalls account for approximately eighty-six percent of the total discharges. Current volumes discharged appear to cause little long-term impacts, but this may change as volumes increase with an increasing coastal population.

In *Namibia*, pollution problems in the Erongo region are associated with commercial and urban activities, especially in and around the Walvis Bay harbour area. The fishing industry is still a major polluter of the seawater in the Walvis Bay due to lack of discharge treatment measures. Effluent wash water is led directly into the sea in the vicinity of water intake for the fish processing plants. Minor oil spills, discharge of waste containing traces of anti-fouling paints, sewage from ships and heavy metals from the export of semi-processed mine ore also contribute to the pollution of the sea water in the harbour and bay area.

In *Angola*, major identified contamination problems, besides the sewage from urban (mainly domestic) origin, marine debris and solid wastes, are the discharges from functioning industries, such as petroleum extraction in Soyo and Malongo, cement factories and soap, edible oil and breweries manufacturers in Luanda, in addition to port installations in Lobito; besides, physical modification, including coastal erosion, of the littoral, particularly in Porto Amboim, Sumbe, is also of concern.

At the *Democratic Republic of São Tomé e Príncipe*, an archipelagic nation which has part of its EEZ inside the proposed Sanctuary, considering the heavy rain in the country and the fragile coastal ecosystems, the most serious problems related to marine and coastal environment are due to huge quantities of sediments carried by rivers, which contribute to the degradation of the aquatic environment.

Brazil, with the largest EEZ and coastline of the South Atlantic, has proportionately large challenges regarding marine contamination, its mitigation and prevention. Today, more than a quarter of the Brazilian population is concentrated along the coast, with a population density of around 87 inhab/km^2, much higher than the national average of 20 inhab/km^2, and whose way of life has a direct impact on the coastal ecosystems. Despite government action taken in recent years to greatly increase sewage treatment systems in coastal townships, large deficits still exist. The sites of the 11 Brazilian refineries, being 9 in coastal areas, as well as the presence of industrial port complexes, especially in the Southeast, makes the accidental

[26] World Bank. 1994. Africa: a Framework for Integrated Coastal Zone Management. Land, Water and National Habitats Division. Africa Environmentally Sustainable Development Division.. 139 p. + cartes HT.

leakage of petroleum and/or derivatives be a great concern for marine contamination. Only in the Guanabara Bay region, Rio de Janeiro, there are two important commercial ports, 16 petroleum terminals, 2 petroleum refineries and various naval shipyards, besides the presence of 2000 gas stations in its vicinity[27].
Petrochemical activity mainly affects the Brazilian Southeast regions as well as parts of the South and Northeast regions, where there are oil terminals, oil duct networks with adjacent petrochemical complexes. Besides the dockside activities of the oil sector, there is also an expanding array of oil extraction platforms in the Southeast and Northeast regions. Petrochemical centers close to oil refineries near the coastal zone have high environmental risk indicators, associated to the vulnerability of natural systems.

Acoustic Pollution

Issues related to the impact of anthropogenic noise on cetaceans have been extensively discussed by the IWC in recent meetings. The South Atlantic is exposed to the effects of international shipping, localized seismic exploration activities, and military operations, though in a much smaller scale than marine regions in the Northern Hemisphere. Currently seismic activities are potentially the greatest concern for the region since it may interfere with still unknown migratory paths and established and unknown breeding grounds (see below).

Hydrocarbon Exploration and Exploitation

Oil and gas exploration and production are known to have negative impacts on whales. These activities occur in several areas of the proposed sanctuary. Hydrocarbon exploitation is frequently undertaken by multi-national corporations, and it would be beneficial if consultation from a coordinated approach regarding mitigation measures could be provided by the existence of a sanctuary with an overall management plan. In Brazil, there are some concerns regarding the relationships between cetacean strandings and seismic surveys and the Precautionary Principle has been applied, prohibiting such activities during the whale reproduction season to avoid risks to the humpback whales in their breeding ground. Brazil is spearheading domestic measures to study, monitor and mitigate the negative impacts of offshore oil exploration on marine ecosystems, and these initiatives may be of benefit to all countries in the South Atlantic region in the context of cooperation at the ocean basin level. In Gabon, there are also concerns regarding short and long-term effects of the current exploitation of hydrocarbon resources by a range of industries, with the perspective of expanding efforts in the next few years, and the absence of adequate legislation to minimize negative impacts on humpbacks and the overall ecosystem.

Significant point sources of marine pollution have been detected around coastal petroleum mining and processing, releasing quantities of oil, grease and other hydrocarbon compounds into the coastal waters of the Niger delta and off Angola, Cameroon, Congo and Gabon[28].Transportation and processing of petroleum poses specific hazards which are also of increased concern as the South Atlantic is opened progressively towards more hydrocarbon mining.

Fisheries Interactions

[27] Rosso, T.C.A and Cirilo, J.A. 2000. Water Resources Management and Coastal Ecosystems: Overview of the Current Situation in Brazil. In: *Littoral 2002, The Changing Coast*, pp. 221-29.
[28] UNEP. 1999. *op. cit.*

Cetacean bycatch is known to occur in several fisheries in the South Atlantic[29]. Although limited schemes to monitor bycatch exist in some countries, there are no estimates of bycatch for most South Atlantic fisheries. High-seas fisheries for squid, shrimp and hake in the Western South Atlantic have impacted small cetacean populations, and concerns apply not only to cetacean by-catch, but also to the high level of wastefulness in relation to discarded catch[30]. Trawling operations off Patagonia have been singled out as a potential threat to the survival of dusky dolphins (*Lagenorhynchus obscurus*) in the region[31].

In Brazil, gillnets are responsible for the by-catch of a number of small cetaceans. Franciscanas (*Pontoporia blainvillei*) and marine tucuxis (*Sotalia fluviatilis*) are the most impacted species[32]. Extensive research on by-catch of these two species have been conducted for a number of years, but specific management recommendations are still lacking. While coastal fisheries are recognized as being responsible for incidental captures, studies identifying the impact of offshore fisheries are still incipient. New deep-sea fisheries which are required by law to have on-board observers, are allowing a new understanding of the magnitude of these impacts[33].

Very little data on actual cetacean bycatch exists for Western Africa.

Collisions with Ships

Negative interactions between large whales and vessel traffic are likely to increase both as a result of the recovery of depleted species and populations and of the economic growth of coastal States in the region. Collisions with Southern right whales[34] and other species have already been recorded both in South Africa and South America. Management measures to reduce the risk of collisions between whales and vessels have generally been very localized but may nevertheless involve global bodies and require consultation with stakeholders in the shipping industry over a much larger scale. For example, recent changes in shipping lanes, introduced to protect North Atlantic right whales in the Bay of Fundy, Canada, required a decision by the International Maritime Organization after widespread consultation. At Abrolhos Bank, Brazil, studies aimed at determining the lower cetaceans density areas supported a recent agreement involving environmental authorities, a shipping industry and local NGO´s to determine the best route for barge navigation to avoid collisions. This model could be replicated in other high-traffic areas in the South Atlantic through a co-operative program aimed at minimizing this threat at an ocean basin scale.

Climate Change

The possible effects of climate change also need to be considered when assessing future

[29] Crespo, E.A., Alonso, M.K., Dans, S.L., Garcia, N.A., Pedraza, S.N., Coscarella, M. and Gonzalez, R. Incidental catches of dolphins in mid-water trawls for Argentine anchovy (*Engraulis anchoita*) off the Argentine shelf. *Journal of Cetacean Research and Management* **2**(1):11-16

[30] Crespo, E.A., Pedraza, S.N., Dans, S.L., Alonso, M.K., Reyes, L.M., Garcia, N.A., Coscarella, M. and Schiavini, A. 1997. Direct and indirect effects of the high seas fisheries on marine mammal populations in the northern and central Patagonian coast. J. Northw. Atl. Fish. Sci. 22:189-208

[31] Dans, S.L., Alsono, M.K., Pedraza, S.N. and Crespo, E.A. 2003. Incidental catch of dolphins in trawling fisheries off Patagonia, Argentina: can populations persist? *Ecological Applications*, 13(3): 754–762.

[32] Di Beneditto, A.P.M. 2003. Interactions between gillnet fisheries and small cetaceans in Northern Rio de Janeiro, Brazil: 2001-1002. *LAJAM* 2(2): 79-86.

[33] Perez, J. A. A. & Wahrlich, R. 2005. A bycatch assessment of the gillnet monkfish *Lophius gastrophysus* fishery off southern Brazil. *Fisheries Research*, 72(1): 81-95

[34] Best, P.B., Peddemors, V.M., Cockroft, V.G. and Rice, N. 2001. Mortalities of right whales and related anthropogenic factors in South African waters, 1963-1998. *J. Cetacean Res. Manage.* (Special Issue 2): 171-176.

threats to cetaceans. There are significant relationships in global climatological effects, and the oceanographic parameters of the South Atlantic are closely linked with those of the Southern Ocean. When considered together with other human activities that alter the marine environment, such as cities, river dams and soil erosion[35], relatively minor changes in global circulation patterns could cause large changes in South Atlantic ecosystems.

[35] Syvitski, J. P. M., Vörösmarty, C. J., Kettner, A. J. & Green,, P. 2005 Impact of Humans on the Flux of Terrestrial Sediment to the Global Coastal Ocean. *Science*, 308: 376-380

5. NATIONAL AND REGIONAL MEASURES FOR WHALE CONSERVATION IN THE SOUTH ATLANTIC

5.1 Regional Perspective

A South Atlantic Whale Sanctuary is not intended to replace or supersede national efforts for cetacean conservation. Rather, it should serve as an umbrella under which adequate co-ordination, co-operation and synergy can be promoted towards achieving common goals. This is of particular importance for the many species which migrate among coastal States´ jurisdictional waters and between these and the high seas, as well as for those species whose offshore habitat use patterns have yet to be properly understood.

An IWC Whale Sanctuary is not a Marine Protected Area in the generally accepted interpretation of these, as under the IWC it only prevents commercial direct takes from impacting cetacean populations. However, the proposed SAWS is intended to promote co-operation well beyond this restricted interpretation, including support for the coordination among MPAs established at national levels or under other relevant international initiatives, such as the World Heritage Convention and UNESCO Man and the Biosphere programme. This objective was actively promoted during recent discussions at the V World Parks Congress[36] and is of paramount importance for future management initiatives in the SAWS. It has recently been noted that novel designs of marine protected areas guided by a consideration of marine mammal distribution and life history may greatly enhance the effectiveness of existing protective measures[37]. A Sanctuary may help provide the co-operation framework for such innovative planning.

The notion of encompassing high seas areas in a Whale Sanctuary as proposed is fully consistent with UNCLOS Article 194 which stipulates measures to protect 'rare and fragile ecosystems **as well as the habitat of depleted, threatened or endangered species** and other forms of marine life' (emphasis added)[38].

5.2 Marine Protected Areas within the SAWS

Four countries, representing the vast majority of national marine jurisdictions in the South Atlantic, and an overseas territory encompassed by the SAWS, have established marine protected areas which, under different categories, provide for the protection of cetaceans and critical habitats. A recent survey indicated that more than 30 MPAs relevant for cetaceans have already been declared in the SAWS, harboring at least 19 whale and dolphin species[39].

5.3 National Legislation

Apart from the designation of specially protected areas, cetaceans are fully protected in most jurisdictional waters of the South Atlantic. In South Africa, the Marine Living Resources Act of 1998 has established strict conservation rules for cetaceans and laid the foundations of

[36] Augustowski, M. and J.T. Palazzo Jr. 2003. Building a Marine Protected Areas Network to Protect Endangered Species: Whale Conservation as a Tool for Integrated Management in South America. Paper presented at the V World Parks Congress, South Africa, 6p.
[37] Hooker, S.K. and Gerber, L. 2004. Ecosystem-based management: the potential importance of megafauna. *Bioscience* 54(1): 27-39.
[38] Prideaux, M. 2003. Beyond the State: building regimes for species protection in all oceans. Hawke Institute paper, University of South Australia, Adelaide, 18p.
[39] Hoyt, E. 2005. *Marine Protected Areas for Whales, Dolphins and Porpoises*. Earthscan, 492p.

whalewatching regulations, which nowadays include a refined operator permit system. In Brazil, the killing, capture or intentional harassment of cetaceans was banned permanently in 1987 through federal law[40]. In Argentina, all cetaceans are protected federally and Provinces regulate its non-lethal use. In Chubut Province, provincial laws and regulations are particularly aimed at the regulation of whalewatching. Also in Uruguay since 2002 federal regulations are in place to prevent harassment of cetaceans and establish appropriate whalewatching norms. Also, species such as the Southern right whale, because of their outstanding cultural and economic value for whalewatching and the development of coastal communities, have been given special protection under different legal measures (eg National Natural Monument in Argentina, State Natural Monument in Santa Catarina, Brazil, etc.).

Many South Atlantic coastal States are developing flexible regulatory frameworks for boat-based whalewatching, with a view of adapting legal norms to the rapidly increasing wealth of knowledge about potential impacts of the activity on cetaceans.

[40] Lodi, L. and Barreto, A. S. 1999. Legal Actions Taken in Brazil for the Conservation of Cetaceans. *Journal of International Wildlife Law and Policy*, 1(3): 403-411

6. APPROPRIATENESS OF THE PROPOSED SANCTUARY AND ITS BOUNDARIES FOR WHALE CONSERVATION

In accordance with Article V(1)(c) of the International Convention for the Regulation of Whaling, it is proposed that the area of the Atlantic Ocean described below be designated as the SOUTH ATLANTIC WHALE SANCTUARY (SAWS). Its endorsement by the IWC will require an amendment in the Schedule through the inclusion of a new sub-paragraph in Chapter III, that should read as follows:

"In accordance with Article V(1)(c) of the Convention, commercial whaling, whether by pelagic operations or from land stations, is prohibited in a region designated as the South Atlantic Whale Sanctuary. This Sanctuary comprises the waters of the South Atlantic Ocean enclosed by the following line: starting from the Equator, then generally south following the eastern coastline of South America to the coast of Tierra del Fuego and, starting from a point situated at Lat 55°07,3'S Long 066°25,0'W; thence to the point Lat 55°11,0'S Long 066°04,7'W; thence to the point Lat 55°22,9'S Long 065°43,6'W; thence due South to Parallel 56°22,8'S; thence to the point Lat 56°22,8'S Long 067°16,0'W; thence due South, along the Cape Horn Meridian, to 60°S, where it reaches the boundary of the Southern Ocean Sanctuary; thence due east following the boundaries of this Sanctuary to the point where it reaches the boundary of the Indian Ocean Sanctuary at 40°S; thence due north following the boundary of this Sanctuary until it reaches the coast of South Africa; thence it follows the coastline of Africa to the west and north until it reaches the Equator; thence due west to the coast of Brazil, closing the perimeter at the starting point. This prohibition shall be reviewed twenty years after its initial adoption and at succeeding ten-year intervals, and could be revised at such times by the Commission. Nothing in this sub-paragraph shall prejudice the sovereign rights of coastal states according to, inter alia, the United Nations Convention on the Law of the Sea."

The IWC Technical Committee Working Group on Whale Sanctuaries (TCWGWS) recommended that "*Information should be provided on the area proposed for designation as a sanctuary. Specific information should be given in support of the boundaries proposed and the degree to which the proposed boundaries relate to existing IWC stock management areas. Information should be given on the degree to which the proposed sanctuary would offer protection to the primary species in terms of ranges and critical areas such as breeding or feeding grounds and migratory pathway or any other ecological consideration*". In addition, the instructions for the review of sanctuaries require the scientific Committee to provide advice on whether the boundaries are ecologically appropriate.

Boundaries of the SAWS were defined (Figure 2) taking into account discussions and recommendations held over the years at the IWC. The northern limit, the Equator, is approximately the northern range of some Southern populations of migratory whales. It has been widely accepted that populations of Southern Hemisphere species (except probably the Bryde's whale) usually do not cross the Equator and therefore do not mix with Northern Hemisphere populations. Studies conducted in South America suggest that minke and

humpback whales migrate as far north as 5ºS[41] and 3ºS[42,43], respectively. Information on the northern range of other migratory rorquals is proportionally limited but it is unlikely that these species mix with North Atlantic populations as well. In addition, although breeding herds of sperm whales are continuously distributed between approximately 40ºS and 45ºN, marking experiments have not identified any sperm whales that have crossed the Equator and therefore it is likely that northern and southern stocks remain separate[44]. Also, differences in breeding season possibly warrant genetic isolation between the two populations[45]. In addition to this, the warm west-east flowing Equatorial Current is placed near the Equator. This current coincides with the northern limit of the SAWS and may serve as an oceanographic boundary to several physical and biological processes that occur in the North and South Atlantic Oceans.

The eastern boundary of the SAWS is established in the western African coast and the 20ºE meridian, which corresponds to the western limit of the Indian Ocean Sanctuary.

The southern boundary of the SAWS is set in the northern limit of the Southern Ocean Sanctuary, which is nearly equivalent to the Subtropical Convergence.

The western boundary is the eastern coastline of the South American continent and the approximate limit of the Atlantic and Pacific Oceans**.**

Within these boundaries specific measures to improve whale conservation have been implemented at smaller scales in the form of zonation specific to whales. As already mentioned above, The South Atlantic Whale Sanctuary could assist in the development of a network of such appropriate localized measures. These could address the issue of protection of critical habitat for whales within a coordinated framework.

From the biological and ecological points of view, the proposed Sanctuary encompasses known breeding grounds for all large whale species in the South Atlantic Ocean. It also takes into account the yet undetailed migratory paths that baleen and toothed whales may use in their way to and from the feeding grounds. For instance, the southern right whales that calve off Península Valdés in Argentina are now known to move as far north as southern Brazil, east as Tristan da Cunha and southeast as near South Georgia[46]. Recent studies have shown that humpback whales wintering off Brazil travel a relatively direct, linear path from wintering to feeding grounds near South Georgia and the South Sandwich Islands[47] Thus, data already exists to prove that large whales do utilize a significant portion of the proposed SAWS as their home range and migratory routes.

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[41] Williamson, G. 1975. Minke whales off Brazil. *Sci Rep. Whales Res. Inst., Tokyo* 27:37-59.

[42] Lodi, L. 1994. Ocorrências de baleias-jubarte, *Megaptera novaeangliae*, no Arquipélago de Fernando de Noronha, incluíndo um resumo de registros de capturas no Nordeste do Brasil. *Biotemas* 7(1,2):116-123.

[43] Siciliano, S. 1997. Características da população de baleias-jubarte (*Megaptera novaeangliae*) na costa brasileira, com especial referência aos Bancos de Abrolhos. MSc. Thesis, Universidade Federal Rural do Rio de Janeiro. Rio de Janeiro, Brazil. xviii + 113pp.

[44] Allen, K.R. 1980. Conservation and Management of Whales. University of Washington Press, Seattle. 107pp.

[45] Best, P.B. 1966. The biology of the sperm whale as it relates to stock management. Chapter 11 in W. Schevill ed. The whale problem: a status report.

[46] Rowntree, V.J, Payne, R.S. and D.M. Schell. 2001. Changing patterns of habitat use by southern right whales (*Eubalaena australis*) on the nursery ground at Península Valdés, Argentina, and in their long-range movements. *J. Cetacean Res. Manage.* (Special Issue)2:133-143.

[47] Zerbini, A. N., Andriolo, A., Heide-Jorgensen, M. P., Pizzorno, J. L. , Maia, Y. G., VanBlaricom, G. R. , DeMaster, D. P., Simões-Lopes, P. C. & Moreira,S. 2004. Identification of a Summering Ground for Humpback Whales from Brazil: results from satellite telemetry. *Resúmenes 11ª Reunión de Trabajo de Especialistas em Mamíferos Acuáticos de América del Sur.*14-19 October, 2004. Quito, Ecuador. p.38-39.

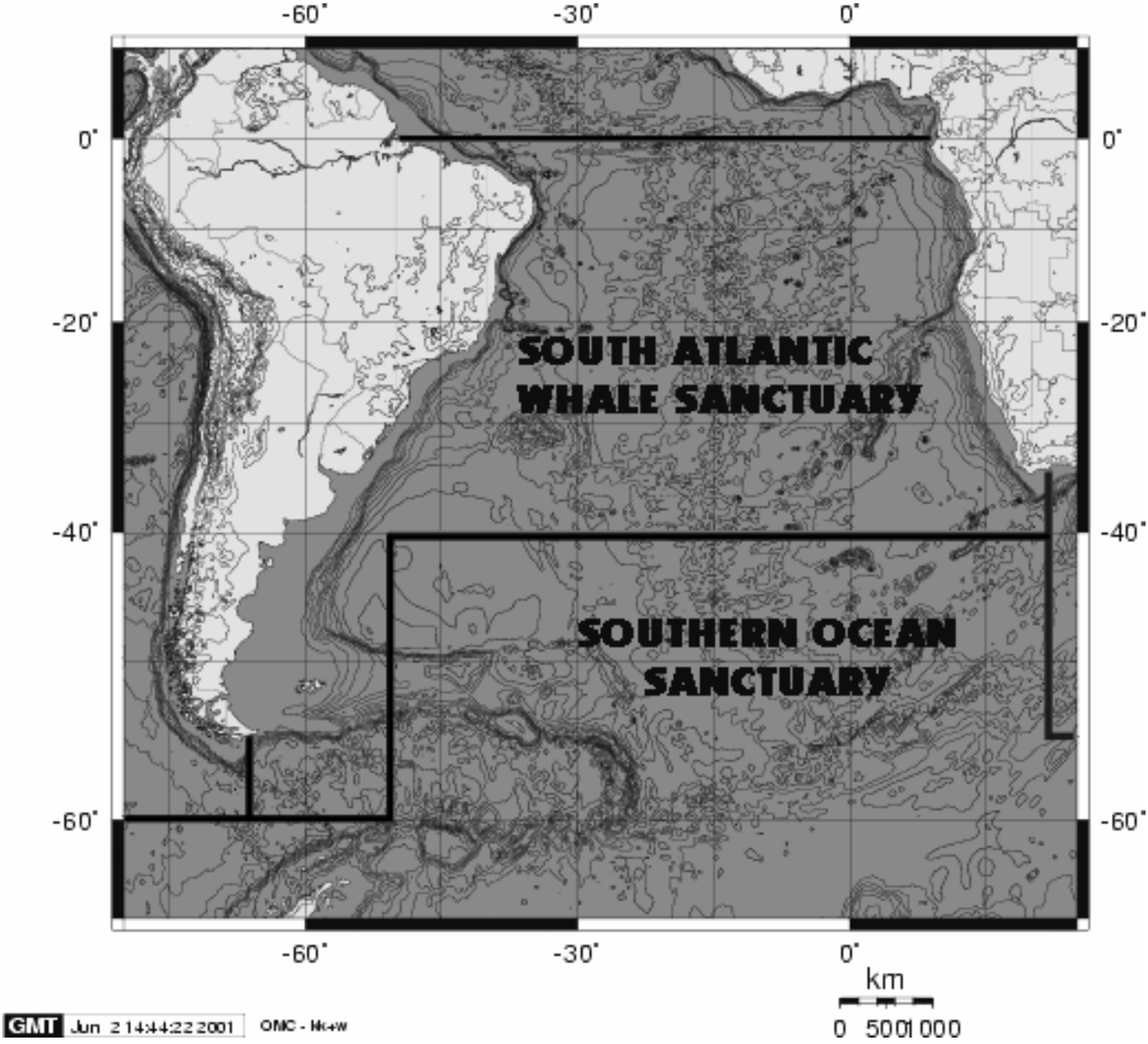

Figure 2. Limits of the South Atlantic Whale Sanctuary, as defined in the Schedule amendment text proposed by Argentina, Brazil and South Africa.

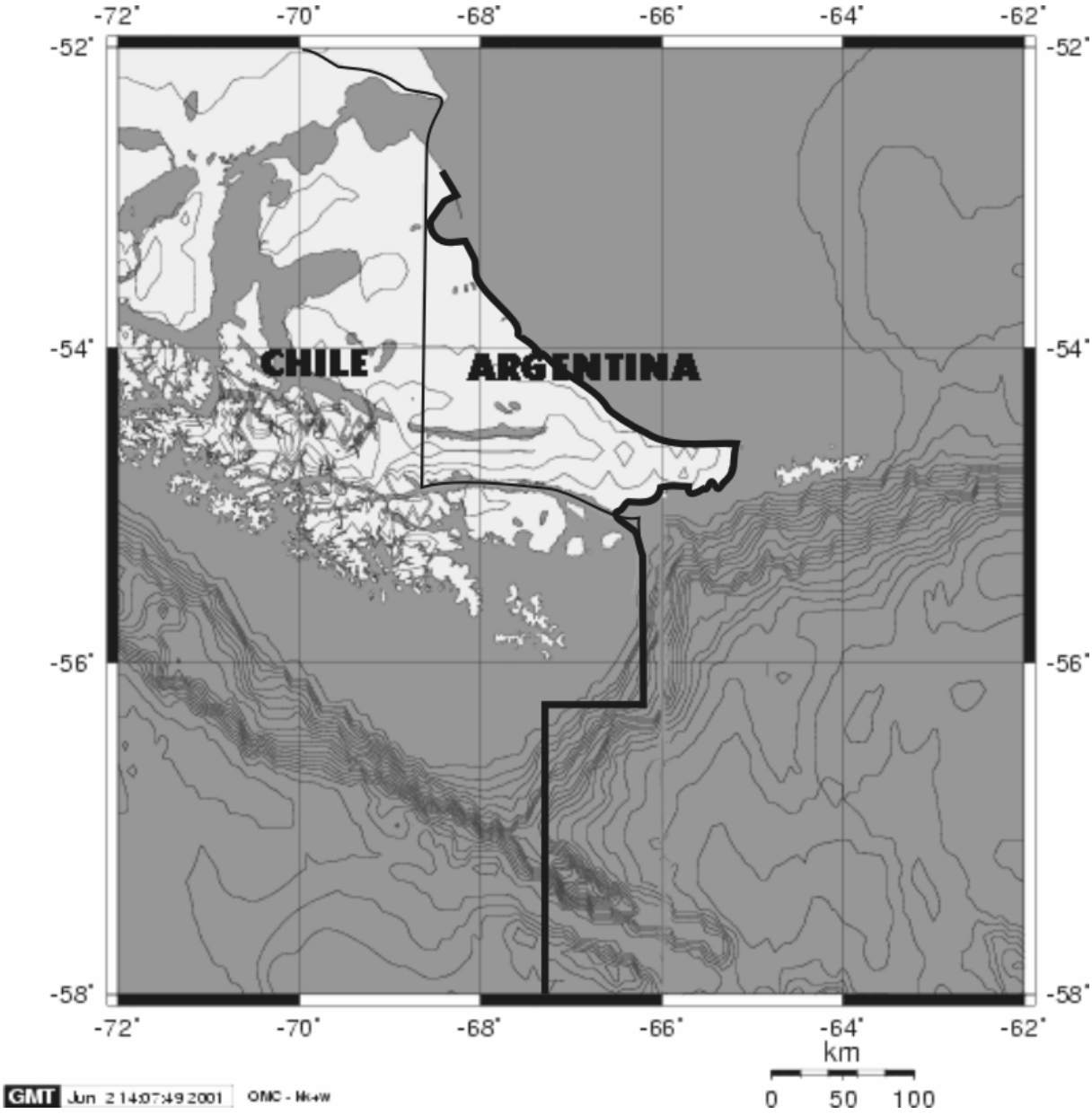

Figure 3. Details of the western boundaries of the South Atlantic Whale Sanctuary, as defined in the Schedule amendment text proposed by
Argentina, Brazil and South Africa.

7. OBJECTIVES FOR RESEARCH AND MANAGEMENT

The preamble to the International Conservation for the Regulation of Whaling recognizes that it is in the common interest to achieve the optimal level of whale stocks as rapidly as possible without causing widespread economic and nutritional distress. Since the coming into effect of the commercial whaling moratorium by the IWC in 1986, utilization of whales by South Atlantic nations has been exclusively non-lethal. For the purpose of non-lethal uses (including, but not limited to, tourism and research), the optimal level of whale populations is the natural or unexploited level because this provides for the highest sustainable abundance of whales. Objectives for the SAWS are therefore set taking into account the reality of the region in terms of the non-lethal use option. This is entirely consistent with Article V of the ICRW as it specifies that closed areas may be designated with respect to the conservation and utilization of whale resources.

7.1 Primary Sanctuary Objectives

The primary goal of the SAWS is to promote the biodiversity, conservation and non-lethal utilization of whale resources in the South Atlantic Ocean. To achieve this goal, its primary objectives are:

1. To maximise the rate of recovery of whale populations to their natural carrying capacity levels, and to monitor and maintain these populations at these levels. This objective requires that all deliberate catches are prohibited in the Sanctuary, and that the Sanctuary includes the entire range of the populations (i.e. ecologically meaningful boundaries) either in itself or in conjunction with the Southern Ocean Sanctuary.

2. To promote the long-term conservation of large whales throughout their life cycle and their habitats with special emphasis on areas of particular importance such as breeding, calving and, for some species, feeding areas, or consistent migratory paths.

3. To stimulate co-ordinated research in the region, especially by developing countries, and through international co-operation with the active participation of the IWC.

Such research would include, among other topics:

- monitoring the recovery of depleted populations;
- surveys of historical open-ocean whaling grounds;
- development of projects and initiatives to better understand migratory routes and movement patterns;
- analysis of threats and potential mitigation measures to those threats across a range of spatial scales;
- monitoring changes in distribution due to: shifts in prey density; temperature changes due to weather patterns and/or possible links to global warming; anthropogenic factors including vessel traffic, seismic activities, etc.;
- analysis of pollutant load in cetaceans and their environment and potential threats for recovery of depleted stocks; and
- development of non-lethal techniques, testing and application of methodologies with possible comparison with other regions.

4. To develop the sustainable and non-lethal economic use of whales for the benefit of

coastal communities in the region, through ecotourism and educational activities such as whale watching, and to provide scientific background to the management of such activities in order to ensure its sustainability over time.

5. To provide an overall framework for the development of localized measures, to maximize the conservation benefits at an ocean basin level.

6. To integrate national research, conservation and management efforts and strategies in a cooperative framework, maximizing the effectiveness of management actions, taking into full account the rights and responsibilities of coastal States under UNCLOS.

7.2 Development of a Sanctuary Management Plan

To date, no Whale Sanctuary established under the ICRW has implemented a management plan. The lack of such plans has however not prevented these sanctuaries from being useful for whale conservation as originally proposed. While it is obviously impossible to draft specific management measures before any area is defined and agreed as a Sanctuary, there are nevertheless many benefits in preparing an adequate management plan which can take into account national and regional whale conservation measures, and integrate efforts at the ocean basin level once the South Atlantic Whale Sanctuary is adopted.

The establishment of the proposed Sanctuary would therefore be followed by the development of a management plan to address protection during vulnerable phases of the whales' life-cycles and important habitats. The management plan would be proposed through liaison with member and non-member coastal States bordering the Sanctuary and relevant national, regional or international bodies, including, as appropriate, the development of proposals for the zoning of the Sanctuary into areas with differing levels of protection for whales. These shall take into account:

- a scientific evaluation of the conservation needs of each whale species/population in each area, including the level of known or potential threats;
- the status of each whale population (e.g. depleted with little recovery; depleted with rapid recovery; not thought to be depleted, or unknown);
- the habitat usage of each species in each area, including for feeding, breeding and migration, and the identification of critical habitat;
- existing research programs and opportunities for future research and cooperation in each area;
- existing areas of whale habitat protection already established by coastal States in the Sanctuary and its current or potential exchanges and synergies;
- existing coastal State policies with regard to the management of marine resources in waters under their national jurisdiction and the potentials for synergy, resource pooling and cooperative exchange, and their sovereign rights as asserted by the United Nations Convention on the Law of the Sea.

It is noteworthy that some of the intended cooperative synergies already occur at the level of jurisdictional waters of some coastal States in the region; for instance, in Uruguay an internationally recognized UNESCO Biosphere Reserve in Rocha and Maldonado States encompasses Southern Right Whale habitat, for which management planning several whale researchers from countries in the region are actively contributing. In September 2004, a

network was created to promote regional cooperation on marine protected areas which include relevant cetacean habitats. The SAWS proposal intends to extend such active cooperation to scopes beyond national jurisdictions and reinforce existing links among scientists, managers and other stakeholders.

While the proposed Sanctuary encompasses both coastal and high seas areas, and international cooperation is needed to monitor some offshore regions, coastal monitoring of cetaceans does contribute invaluable data for research and should be included in any management plan initiative. The integration of geographically-based research cooperation networks is an essential tool for the achievement of Sanctuary objectives. In this regard, strandings networks, such as those already established in Brazil and which cover more than 4,500 Km of coastline through the work of 23 governmental and non-governmental institutions, can be integrated in a Sanctuary monitoring program in a cost-effective manner.

It is understood that, in accordance with the provisions of the proposed Sanctuary, any such plan shall not imply an interference with the sovereign rights of coastal States, but rather will represent an opportunity for cooperation and shared benefits, recognizing the importance of national roles in safeguarding the common heritage represented by whale species and populations of the South Atlantic.

7.3 Other Research and Management Aspects and Opportunities relevant to the SAWS

The South Atlantic Ocean is bordered exclusively by developing nations. These have historically faced difficulties for the development of marine research given the limited financial resources normally available for both public and private scientific endeavors.

This general situation notwithstanding, South Atlantic nations have made enormous progress in the past few decades towards a better understanding and proper conservation and utilization, through non-lethal means, of the whale resources present in the region. This is especially true of Argentina, Brazil and South Africa, where local scientists and institutions have advanced significantly towards a comprehensive understanding of cetaceans both large and small that inhabit the region.

In particular, endangered and threatened species such as Southern right whales and humpback whales have been the subject of long-term studies in their calving grounds. Breakthrough achievements in the region are well known and it is noteworthy to mention that the South Atlantic, in particular its Western margins, Gabon and Southern Africa, is a region where non-lethal research on whales has been greatly developed by cooperative research efforts since the early 1970's.

With the growing interest in whalewatching in the region came a parallel interest of the native researchers in studying its effects and potential impacts on whale populations subject to this very important economic use of whale resources. Ensuring the long-term sustainability of whalewatching is an essential part of its development. Thus, research on the operation and effects of whale watching has been under way in Argentina, Brazil and South Africa, which are three countries where this activity is already economically important and growing[48,49,50].

[48] Rivarola, M., Campagna, C. and A. Tagliorette. 2001. Demand-driven commercial whalewatching in Península Valdés (Patagonia): conservation implications for right whales. *J. Cetacean Res. Manage*. (Special Issue)2:145-151.

Stock identity, population size, ecology and behavior of large whales in the South Atlantic are all aspects of research which have greatly progressed in the region through the use of non-lethal techniques. A brief look at the leading international scientific journals in the field, and the growing participation of scientists from the region in relevant international scientific meetings, will give abundant evidence of the efforts and results of research conducted by Range States of the South Atlantic.

Relative to the national budgets currently available in the region for marine mammal research, these results continue to represent a unique achievement as far as cost-benefit ratios are considered.

However, much remains to be addressed in the region concerning scientific research, especially on pelagic species. For instance, Balaenopteriids must be better assessed, and for blue, fin, sei, Bryde's and minke whales there are enormous uncertainties regarding population size, stock structure, calving ground boundaries and migratory routes. Progress in these topics can be achieved respecting the Range States' sovereign decision to pursue scientific research through non-lethal means, if only more international cooperation could be organized and implemented.

Encompassing the breeding grounds for all large whale species in the South Atlantic, plus feeding areas for at least two such species (Bryde's and sperm whales), and migratory corridors yet to be properly surveyed, the SAWS offers a unique opportunity for international cooperation in obtaining vital information concerning these species' life cycles. For instance, open ocean surveys of the 'Brazilian Banks' which concentrated historic catches of foreign whaling fleets in the region; satellite tracking of migrating individuals; further interaction between research in breeding grounds and that conducted inside the Southern Ocean Sanctuary, are all windows of opportunity that could benefit immensely from the establishment of an IWC Sanctuary in the region. The cooperation thus fostered by the Commission would benefit primarily its developing country members in the region by enlisting local and foreign scientists and institutions alike in a cooperative manner.

7.4 Issues Arising from Recent Discussions on Sanctuaries at the IWC and its Scientific Committee

Starting from prohibiting commercial whaling in a marine area, the IWC now looks at developing a coherent scheme for scientific research and including habitat preservation considerations in the overall objective of protecting whale species[51]. This is consistent with the notion of evolving interpretation of its founding treaty and decidedly highlights the importance of sanctuaries in a global whale conservation framework.

Scientific uncertainty is deeply imbedded in international environmental law[52], and the

[49] Groch, K.R, 2002. Monitoring behavioral responses of right whales to whale watching activities in the Right Whale Sanctuary in southern Brazilian coast. Report submitted to the International Fund for Animal Welfare, Yarmouth Port, MA, USA. 21 pp.

[50] Morete, M. E., Freitas, A.C., Engel M. H. and Glock, L. 2000 Tourism characterization and preliminary analyses of whale watching on Humpback Whales (Megaptera novaeangliae) around Abrolhos Archipelago, southeastern Bahia, Brazil. IWC Scientific Committee Working Paper SC/52/WW6.

[51] Morgera, E. 2004. Whale Sanctuaries: An Evolving Concept within the International Whaling Commission. *Ocean Development & International Law*, 35:319–338.

[52] Weiss, E.B. 1993. International Environmental Law: Contemporary Issues and the Emergence of a New World Order. *Geo. L.J.* **81**:675, 676.

Precautionary Principle became recognized in modern legal instruments in order to tackle this reality. This is especially true in relation to whale management, given the migration patterns of whales throughout the world's oceans, low rates of reproduction, late onset of sexual maturity and the potential for small populations in relation to the extension of habitat for several species[53,54], especially after the depletion brought by decades of commercial whaling. Accordingly, current methods for ascertaining whale populations have proven dangerously inaccurate because the data are subject to several biases and methodological flaws, and in many cases an absolute lack of definitive data on species´ stock divisions and actual distribution.

While political opponents of whale sanctuaries as management tools have used *ad nauseam* the argument that the establishment of such sanctuaries by the IWC shall be based on scientific findings as mentioned in the Convention text, it is clear that the 1946 Convention does not provide a precise definition of the scientific basis for the establishment of a closed area, thus leaving undetermined the kind of evidence that needs to be brought forward by proposing member States[55]. It is abundantly clear to anyone following the proceedings of the IWC that a relevant part of its Scientific Committee is deeply divided along differences of opinion regarding whaling and whale management which are not necessarily restricted to scientific arguments. This well-known fact makes it currently impossible to reach any consensus at Committee level on issues such as Sanctuaries. Nevertheless, productive discussions can be held within the framework of the Committee, which may help the Commission as a whole decide on the merits or otherwise of proposed new sanctuaries.
It must also be noted that while scientific findings are relevant, they by no means exhaust the reasons why sanctuaries are important as management tools.

During the review of the Southern Ocean Sanctuary in its 2004 meeting, the Scientific Committee developed a series of recommendations to facilitate evaluation in future reviews (items 1-7 below). It was also recognized at that time that many of these recommendations were relevant to the review of proposals for new sanctuaries:

"(1) The purpose(s) of the SOS (and other IWC Sanctuaries) should be better articulated through a set of refined overall objectives (e.g. preserving species biodiversity; promoting recovery of depleted stocks; increasing whaling yield). In particular, the relationships between the RMP and the Sanctuary programme should be articulated.

(2) Appropriate performance measures both for Sanctuaries in general, and the SOS in particular, should be developed. These performance measures should link the refined objectives of the SOS with monitoring programmes in the field.

(3) Systematic inventory and research programmes should be established or further developed so as to build the required information base for a Sanctuary management plan and subsequent monitoring programmes.

(4) A Sanctuary management plan should clearly outline the broad strategies and specific actions needed to achieve Sanctuary objectives (e.g. how to protect *x*% of a given feeding

[53] Burns, W.C. 1997. The International Whaling Commission and the Future of Cetaceans: Problems and Prospects. 8 Colo. *J. Int'l Envtl. L. & Policy* 31, 31.
[54] Schiffman, H.S. 1996. The Protection of Whales in International Law: A Perspective for the Next Century, *Brook. J. Int'l L.* **22**: 303-308.
[55] Gillespie, A. 2000. The Southern Ocean Sanctuary and the evolution of international environmental law. *International Journal of Marine and Coastal Law* **3**: 293.

area for stock *y*).

(5) A monitoring strategy that measures progress toward achieving the Sanctuary objectives should be developed and subsequently implemented. A key component of this monitoring strategy would be the development of tangible indicators to monitor progress.

(6) Review criteria that reflect the goals and objectives of the Sanctuary (as described above) should be established.

(7) The Sanctuary management plan should be refined periodically to account for ecological, oceanographic and possible other changes in an adaptive fashion."

The objectives of the proposed SAWS are listed in the beginning of this section. These include both research and management objectives. Some of the research objectives are already being addressed to some extent and the role of SAWS would be to stimulate co-ordinated research at a regional level through international co-operation with the active participation of the IWC. Co-ordinated, multi-disciplinary, research is widely recognized as being essential for management but it is clearly difficult to identify performance measures for quantifying the role of SAWS in this context. In previous reviews of IWC sanctuaries the Scientific Committee has not been able to agree on ways to measure research effort undertaken in response to the Sanctuary designation, compared to what might have been undertaken without a Sanctuary. Nevertheless, the proposed management plan to be established through liaison with member and non-member coastal States bordering the Sanctuary and relevant national, regional or international bodies, would be a new initiative whose success could be evaluated. In particular, an objective of SAWS is to provide an overall framework for the development of localized measures to maximize the conservation benefits at an ocean basin level. The necessary steps to achieve this objective will involve quantifying the combined contribution of localized management initiatives to overall conservation objectives. Although strictly not a performance measure of SAWS itself, this objective could provide a framework to measure the combined performance of the network of measures within SAWS.

Aspects of whale population management objectives in the SAWS

In the case where utilization is exclusively non-lethal, the optimal level of whale stocks is taken to be the natural level that stocks will attain in the absence of exploitation, because there is no advantage for such uses in reducing or holding stocks below this level. The maximum possible abundance of whales is the appropriate target level for these purposes because it:

(i) maximizes the encounter rate of whales, by research and whale-watching vessels, in areas where whales already occur;
(ii) maximizes the likelihood of whales expanding their range and re-colonizing habitats occupied historically in pre-whaling times;
(iii) provides the greatest margin of safety, and time for remedial action, in the event of possible unexpected detrimental factors that may impact whales in the future.

One of the management objectives of the proposed South Atlantic Whale Sanctuary is to allow depleted whale populations to recover to their unexploited levels as rapidly as possible. The unexploited level is taken to be the pre-whaling level, subject to any natural or human-caused changes in carrying capacity that may have occurred in the meantime. To this end,

avoidable takes of whales are to be minimized.

The RMP and SAWS

In 1994 the IWC accepted the RMP model as a component of the yet to be adopted RMS. Previous debates about the scientific justification for whale sanctuaries have polarised on the degree of protection an accepted RMP and RMS would afford whale stocks. The RMP requires estimates of current whale abundance, and while the conservative nature of this model intends to incorporate the uncertainty around such estimates, the experience of the past decade has been that abundance estimates are extremely difficult to derive and agree upon[56]. Furthermore, problems associated with the back-extrapolation of abundance estimates to calculate pre-exploitation whale numbers have been identified. Difficulties with the use of traditional, generalised logistic models of population dynamics for such purposes, as well as the current uncertainty (and order of magnitude differences in estimates) of genetic approaches, have been recently pointed out[57]. The associated problems of determining current and historic whale abundance mean it may not be possible to place the current population status of Southern Ocean whale stocks in the context of recovery from over-harvest. The RMP also relies on determining stocks and stock boundaries such that any take can be attributed to each putative stock. The understanding of the stock structure of Southern Hemisphere whales (except perhaps Humpback and Southern Right Whales) remains rudimentary.

The management objectives of the South Atlantic Whale Sanctuary differ significantly from those of the RMP. While both share the objective of conserving whale stocks and avoiding their extinction, a further objective of the RMP is to make possible the highest continuing lethal yield from whale stocks. The objectives of the Sanctuary involve exclusively non-lethal uses, for which different target levels for whale populations would apply than for lethal uses. It would, therefore, not be appropriate to apply the RMP target levels or catch limit formulae to whales within the Sanctuary.

This does not imply a rejection *per se* of the scientific validity of the RMP as a means to achieve the management objectives for which it was designed, but merely that the management objectives of the Sanctuary are different from those which the RMP was developed to meet.

It is important to note that the RMP cannot be legitimately applied in practice before the IWC agrees on a new international whaling management system (called the Revised Management Scheme, RMS) which encompasses many vital aspects of the activity, such as inspection and observation, compliance, and costs, besides the setting of catch quotas. Protracted negotiations on an RMS have been under way for a long time, and the discussion and establishment of whale sanctuaries must not be stalled in the meantime, given the patently diverse nature of management options for lethal and non-lethal uses of whale resources.

There is considerably more overlap between the objectives of the proposed South Atlantic Whale Sanctuary and the existing Southern Ocean Sanctuary. In view of the regular migration of many whale stocks between the area of the proposed SAWS and parts of the SOS, co-ordination of research and management activities developed in the two sanctuaries

[56] Davies, C.R. and Gales, N. 2004. A brief review of Sanctuary theory as it applies to the review of the Southern Ocean Sanctuary and observed patterns in great whale populations in the Southern Ocean. Paper IWC/56/SOS2.
[57] Baker, C. S., and Clapham, P. J. In press. Modelling the past and future of whales and whaling. *Trends in Ecology and Evolution*.

will be very important.

Performance measures for SAWS

Worldwide experience with the recovery of depleted whale populations towards their natural levels is still fairly limited. Hence specific performance measures, in terms of how quickly depleted populations may be expected to recover, both in terms of numbers of whales and in terms of occupied habitat, are hard to specify. It is more important to ensure that recovering populations are monitored, so that their population dynamics and interaction with their environment become better understood over time.

Ideally, the residual human impacts on whales in the SAWS should be such that the population levels attained are not substantially less than the levels they would reach in the absence of any disturbance, say within 10%. However, our understanding of the relationship between whale population dynamics and impacts on habitat needs to improve before we can quantify the relationship and determine what additional protective measures are required to achieve a given target.

Data from existing and expanding long-term whale monitoring programmes in the South Atlantic can be used to assess whether the goals of SAWS related to the recovery of whale populations are being achieved. For humpback and Southern right whales, such programmes have already been in place for decades using a variety of efficient non-lethal research methodologies, such as photo-identification, biopsy sampling and, more recently, satellite telemetry. The SAWS can have a crucial role in helping national programs in the region to build upon existing co-operative efforts.

Some milestones could therefore be established to help achieve SAWS objectives, including *inter alia*, estimate the abundance, trends and stock structure of coastal breeding whales along the east coast of South America and west coasts of Africa, through sighting and biopsy surveys, with an emphasis on humpback whales and southern right whales, as an index of population status of species that feed in the Southern Ocean such that estimates of when, and at what level, stocks reach their carrying capacity, and how this varies in time and space; and continue to support IWC efforts to estimate the abundance and trends of Southern Ocean pelagic whales on their feeding grounds through non-lethal sightings and biopsy surveys such that estimates can be derived of when, and at what level, stocks reach their carrying capacity, and how this varies in time and space.

It would be crucial to ensure that data derived from these milestones are made available to relevant bodies of the Convention on the Conservation of Antarctic Marine Living Resources for its effort to construct meaningful models of Southern Ocean ecosystems.

8. NON-LETHAL APPROPRIATION OF WHALE RESOURCES IN THE SOUTH ATLANTIC: A LEGITIMATE MANAGEMENT OPTION OF COASTAL STATES

The issue of conservation, development, and optimum utilization of whale resources in accordance with Article V of the International Convention for the Regulation of Whaling must be interpreted, as already discussed in the Introduction to this document, in light of recent international practice and the rights of coastal States. Such utilization is no longer exclusively related to harvesting whales, but also encompasses whalewatching activities, non-lethal scientific research, and sociocultural values of these animals[58]. Therefore, with respect to the "optimum utilization of whale stocks," the sovereign interests of non-whaling countries of the Southern Hemisphere, whose tourism activities depend on whalewatching, are better protected by conservation measures such as sanctuaries[59].

The establishment of a Sanctuary in the South Atlantic to provide for the conservation and optimum non-lethal utilization of whale resources is entirely in line with the application of the Precautionary Principle as commonly accepted in international fora. Principle 15 of the 1992 UNCED Rio Declaration states:

> **"In order to protect the environment the Precautionary Approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation".**

In this context, and in light of the history of commercial whaling, which has brought **serious**, if not yet irreversible, damage to most exploited whale species, the establishment of a Sanctuary as proposed:

- averts the risk of scientific uncertainty brought about by the application of catch calculation quotas and its potential effects, cumulative with other impacts, on the recovery and stability of whale populations;
- is clearly a low-risk management strategy;
- is clearly a cost-effective management strategy; and
- takes fully into account the needs and values of coastal communities currently using whale resources in the region.

The establishment of the SAWS will not bring any economic hardship on Range States, as no nation in the South Atlantic currently practices whale killing as an economic activity or for aboriginal/subsistence purposes. The SAWS is intended not only to enhance scientific activity but also to protect and foster the economic benefits that many local communities in the region are obtaining from the sustainable utilization of whale resources through whalewatching as a key catalyst to regional ecotourism.

The Commission, through its Resolutions and proceedings, has already asserted the benefits of whalewatching in the economic and social contexts, and has taken responsibility for supporting member nations in devising appropriate means to ensure the sustainability of this practice. Such assertion was confirmed when, according to the Chairman's Report of the 50th

[58] Palazzo Jr., J.T. 1999. Whose Whales? Developing countries and the right to use whales by non-lethal means. *J. Intl. Law Policy* 2(1):69-78.
[59] Gillespie, A. *op. cit.*

IWC Annual Meeting, delegations identified the following as among the reasons for promoting whalewatching around the world:

- It offers new opportunities for developing for coastal communities;
- It can represent substantial economic benefits;
- It is sustainable, non-consumptive use of cetaceans offering opportunities for non lethal research
- It offers opportunities for education and development of research methodologies.

IWC member nations of the South Atlantic have established whalewatching operations whose economic importance is recognized, and which have great potential for increase. In Argentina, For instance, whalewatching in Península Valdés, Argentina, generated revenues of at least U$D 16 million for the local tourist industry in 1997[60]. Between 1991 and 2004 the number of whale watchers taking boat trips there increased almost 450%, from 17,446 to 96,303[61]. In Brazil, Southern right whales are the basis for a fast-growing boat- and shore-based ecotourism industry along the States of Santa Catarina and Rio Grande do Sul, and humpback whales off the State of Bahia are utilized for tourism in at least seven communities. Uruguay is establishing government-sponsored land-based platforms for whale watching along the shores of Punta del Este and surroundings with increasing public interest[62]. In South Africa, 20 communities benefiting from whale watching have been identified. Collectively, South Atlantic States account for more than 750,000 'consumers of whale products', that is, people directly enjoying whalewatching and benefiting at least 43 coastal communities[63]. These activities are interwoven with both research and public education development, and are in many cases fundamental for these. Namibia, Angola, São Tomé and Príncipe and Gabon are all nations with a .growing potential for the development of similar non-lethal uses and which could benefit from further international co-operation and capacity-building in this field.

While species are indeed protected by national legislation of the South Atlantic Range States and at their feeding ground in the Southern Ocean Sanctuary, they remain highly vulnerable during their migration and permanence outside national jurisdictional waters. Closing this gap is essential to ensure that the conservation and sustainable use policies of IWC member States in the region are upheld properly by the Commission.

Whalewatching is an economic option which presents a series of immediate social benefits for the people of developing countries, especially coastal communities, often in areas where other economic options are scarce. The fact that no whales are being killed for the fruition of these gains cannot be argued in an attempt to deny, undermine or otherwise diminish the sovereign rights of States to assert and maintain said non-lethal, actually sustainable uses. Rather, using cetaceans non-lethally during part or the entirety of their natural life cycle is a management option that not only promotes sustainability, but also allows for their expanded fruition in the same manner by other nations and peoples. By benefiting from the "interests gained" (i.e., the revenue generated by observing living whales) and not from the "capital" (i.e., the revenue generated by killing whales), whalewatching makes sustainable use of this natural resource. Contrary to the whaling industry (which has historically been shown to deplete its own resource base, having under several management regimes been entirely unsuccessful in

[60] Rivarola, M., Campagna, C. and A. Tagliorette. *op. cit.*
[61] Sironi, M., Schteinbarg, R., Losano, P. and Carlson, C. 2005. Sustainable whale watching at Península Valdés, Argentina: An assessment by owners and captains of local whale watch companies. IWC paper SC/57/WW2.
[62] García, R. 2000. Cinco años de avistaje sistemático de ballena franca austral (*Eubalaena australis*) em Uruguay: de la investigación a la conservación. *Resúmenes 9ª Reunión de Trabajo de Especialistas em Mamíferos Acuáticos de América del Sur*, Buenos Aires.
[63] Hoyt, E. 2005. *op.cit.*

ensuring sustainability), whalewatching and non-lethal scientific research can potentially profit from this resource indefinitely over time.

It is also important to note that whale watching in South Atlantic coastal States is not limited to those who participate in whale watching tours. Enjoyment and appreciation of whales is brought to millions through the media of television, magazines and books; efforts under way to rescue historical aspects of whales in the settlement of coastal areas and economic development; and socio-cultural events and opportunities.

In Brazil both humpback and southern right whales are at the very center of historical research and education linked to the early settlement of the nation, and cultural events linked to the seasonal presence of these whales in breeding grounds have become a landmark for coastal communities in the States of Bahia and Santa Catarina.

Similar developments are taking place in Uruguay with the rescue of whaling history in Isla Gorriti, Punta del Este, and its integration into the interpretation programs of the whalewatching industry.

Argentina celebrates its right whales both as a National Monument and under special legal protection in provincial regulations which recognize its social importance.

In South Africa, the Hermanus Whale Festival is one of the most relevant cultural events of the Cape Province thanks to the seasonal presence of right whales.

Ex situ whale watching and appropriation of whales as cultural resources, therefore, is an important social component both in terms of the economic turnover and also as part of the cultural identification of South Atlantic States as they cherish their marine natural heritage.

The Non-lethal Appropriation of Whale Resources:

- **is a sovereign right of coastal developing nations which must be protected;**
- **allows for economic growth in coastal communities through means that promote locally distributed revenues;**
- **stimulates scientific activity through modern research methodology with negligible impact on target animals and populations;**
- **represents the actual sustainable use of the resource and its continuation in a long-term basis;**
- **provides for the distribution of benefits from biodiversity as prescribed in the Convention on Biological Diversity;**
- **allows for the shared resource use by many communities in different nations by preventing the resource consumption by a single user group.**

Apart from whalewatching, non-lethal scientific research centered at, or related to, living cetaceans, is another form of sovereign appropriation of whale resources that is promoted in

the SAWS context. **In 2004 alone, through their Progress Reports, Argentinian, Brazilian and South African scientists reported 91 scientific peer-reviewed published papers and 25 communications in scientific fora on cetaceans to the IWC, prepared by scientists from 35 institutions and encompassing data on 43 of the 53 cetacean species occurring in the SAWS – a wealth of data produced using exclusively non-lethal research methodologies**. Information on recent non-lethal research on humpback whales off Gabon has also become available through scientific journals and meetings, and there has been recent research cooperation among African scientists to promote surveys off Namibia and Angola.

9. WHALE SANCTUARIES AND THE FUTURE OF GLOBAL WHALE MANAGEMENT

The regulation of commercial whaling prior to the commencement of the Moratorium is widely recognized to have been ineffective, and the target species of great whales in the Southern Hemisphere were dramatically depleted[64]. The recovery of many of these long-living, heavily depleted species could take from decades to centuries[65].

While the IWC was initiated by countries which were, back in 1946, conducting whale killing activities, the evolution of national societies, their values and therefore mandates given to their representative governments in international agreements, have clearly reflected on the operation of international relations. Conservation has therefore become a core issue on the Agenda of the IWC[66,67]. This was evidenced by, *inter alia*, the adoption of the moratorium on commercial whaling; the establishment of the Scientific Committee´s standing working group on environmental concerns and working group on whale watching; the organization of the 1996 workshop on climate change and cetaceans; and the recent establishment of a Conservation Committee to develop a conservation agenda for the Commission. It was recognized that the IWC was one of the competent international organizations for the conservation, management, and study of cetaceans, addressed by Article 65 of the United Nations Convention on the Law of the Sea, with reference to the duty to cooperate to conserve marine mammals[68].

The adoption of further sanctuaries in the Southern Hemisphere will ensure that entire populations of whales are adequately conserved and will foster cooperative research in large scale. Australia and New Zealand announced in 1998 their intent to propose a South Pacific Whale Sanctuary and have since promoted active discussion of its proposal. The SAWS proposal can effectively add to its stated intent, and the IWC may be able to adopt a Hemisphere-wide sanctuary system whereby the proactive scientific research, and the right to sustainably use whales through non-lethal means by Range States, is recognized and supported by the Commission as the proper international management organization for the conservation of whales.

The extension of cetacean protection afforded by coastal South Atlantic States in most of the ocean basin´s recognized EEZs is timely and legitimate. Today, the time-honoured concept of freedom of the sea is to be understood in the context of the present range of marine activities and in relation to all the potentially conflicting uses and interests, such as the protection of the marine environment and the sound exploitation of marine living resources[69]. In the South Atlantic such exploitation for the shared resource represented by cetaceans is only sound and acceptable if it respects the non-lethal management options currently implemented.

In spite of its expansive goals and theoretically sound framework, the IWC has repeatedly

[64] Holt, S.J. 2002. The whaling controversy. *Fisheries Research* 54:145-151
[65] Davies, C.R. and Gales, N. *op. cit.*
[66] Morgera, E. 2004. Whale Sanctuaries: An Evolving Concept within the International Whaling Commission. *Ocean Development & International Law*, 35:319–338.
[67] Birnie, P. 1985. The Role of Developing Countries in Nudging the International Whaling Commission from Regulating Whaling to Encouraging Non-consumptive Uses of Whales, *Ecology Law Quarterly* (1985): 937.
[68] Davis, K.S. 1985. International Management of Cetaceans under the New Law of the Sea Convention. *Boston University International Law Journal* 477: 504 and 515.
[69] Scovazzi, T. 2004. Marine Protected Areas on the High Seas: Some Legal and Policy Considerations. *International Journal of Marine and Coastal Law* 19(1):1-17.

failed to create a successful protocol for the regulation of commercial whaling. While the Commission has played a significant role in bringing the world's attention to the plight of the whales, many provisions have left it unable to enforce its own regulations[70].

Although South Atlantic members of the IWC have to date generally supported the development of the RMP and later the Revised Management Scheme (RMS), the Commission has at the time of writing still not adopted it, despite over 10 years of protracted negotiations, in particular because of a consistent refusal of whaling countries to abide by international inspection and observation standards and to agree on measures to protect the interests of non-whaling countries and uphold their rights to the non-lethal appropriation of whale resources. The Commission's failure to conclude the RMS should not become a reason for failing to move forward with alternative management systems, such as the SAWS, in cases where these are more appropriate to the needs and objectives of most countries in the region.

The proposal for a South Atlantic Whale Sanctuary is an essential part of the negotiations to accommodate differing interests in the International Whaling Commission, and safeguarding the South Atlantic Ocean from the resumption of commercial whaling, in particular by whaling interests foreign to the region, is of paramount importance to the future of the IWC.

[70] Ruffle, A.M. 2002. Resurrecting the International Whaling Commission: Suggestions to Strengthen the Conservation Effort. Brooklyn Law School paper.

ANNEX
CETACEAN SPECIES OF THE SOUTH ATLANTIC WHALE SANCTUARY*

MYSTICETES

Southern Right Whale, *Eubalaena australis*

Southern right whales migrate from feeding areas in subantarctic regions and concentrate near the coast along the South American and African coasts. The species has been observed in its major wintering grounds off the coast of Argentina (Península Valdés), Brazil (Southeastern and Southern Brazil, with recent and increasing sightings at Abrolhos Bank in the Northeast) and Western South Africa[71,72,73,74].

Right whales were hunted for centuries and are now the most endangered of all baleen whales. Hunting in the southern hemisphere reduced the Southern right whale population from an estimated 55,000-70,000 animals before commercial whaling to 7,500 at present. The annual growth rates of these right whale populations range between 7 to 8% per year but a recent study found that right whales off Brazil have been increasing at a rate of 14% per year[75]. A possible explanation for the increase is immigration from other wintering grounds such as Peninsula Valdés, Argentina. Resightings of females photographed in Brazil that were also photographed in other years with calves on the wintering ground off Península Valdés[76] indicate that some females are using different calving grounds in different years. The preliminary comparison of catalogues from these two wintering grounds resulted that 11% of right whales identified off Brazil have been resighted off Península Valdés, in different years[77]. Resightings have also been observed between Argentina and Tristan da Cunha as well as South Africa and Gough Island, indicating that right whales can also make eastward movements in the South Atlantic[78]. Changes in the spatial distribution of right whales around Península Valdés and South Africa have been observed, indicating that right whales can be flexible in several aspects of their habitat use[79].With the increasing number of right whales along the Southern hemisphere, we can expect the whales to expand their range as they have off Argentina and South Africa [80],[81].

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* We are grateful for the contributions made by Alexandre N. Zerbini, M.Sc., to this annex.

[71] Best, P.B., R. Payne, V. Rowntree, J.T. Palazzo and M. C. Both. 1993. Long-range movements of South Atlantic right whales, *Eubalaena australis*. *Marine Mammal Science* 9(3):227-234

[72] Rowntree, V.J, Payne, R.S. and and Schell, D.M. 2001. Changing patterns of habitat use by southern right whales (Eubalaena australis) on their nursery ground at Península Valdés, Argentina, and their long-range movements. *J. Cetacean Res. Manage*. (Special Issue 2): 133-143.

[73] Simões-Lopes, P.C., Palazzo Jr., J.T., Both, M.C. and Ximenez, A. 1992. Identificação, movimentos e aspectos biológicos da baleia franca austral (*Eubalaena australis*) na costa sul do Brasil. Pages 62-66 *in* Anales de la III Reunión de Trabajo de Especialistas en Mamíferos Acuáticos de America del Sur, 25-30 Julio 1988, Montevideo, Uruguay.

[74] Santos, M.C.O., Siciliano, S., Souza, S.P., Pizzorno, J.L.A. 2001. Occurrence of southern right whales (*Eubalaena australis*) along southeastern Brazil. *Journal of Cetacean Research and Management* (special issue 2): 153-156.

[75] Groch, K. R., Palazzo Jr., J. T., Flores, P. A. C., Adler, F. R. and Fabian, M. E. 2004. Recent rapid increases in the Brazilian right whale population. *Paper presented to the IWC Scientific Committee, Sorrento, July 2004* SC/56/BRG30: 13pp.

[76] Best, P.B., R. Payne, V. Rowntree, J.T. Palazzo and M. C. Both. 1993. Long-range movements of South Atlantic right whales, *Eubalaena australis*. *Marine Mammal Science* 9(3):227-234

[77] Groch, *unpubl.*

[78] Best, P.B., R. Payne, V. Rowntree, J.T. Palazzo and M. C. Both. 1993. Long-range movements of South Atlantic right whales, *Eubalaena australis*. *Marine Mammal Science* 9(3):227-234

[79] Best, P. B. 2000. Coastal distribution, movements and site fidelity of right whales *Eubalaena australis* off South Africa, 1969-1998. *S. Afr. J. Sci.* 22: 43-55.

[80] Best, P. B. 1990. Trends in the inshore right whale population off South Africa, 1969-1987. *Marine Mammal Science* 6(2): 93-108.

[81] Rowntree, V.J, Payne, R.S. and D.M. Schell. *op. cit.*

Since 1994, new records of Southern Right Whales were recorded at the province of Santa Cruz (Patagonia, Argentina) approximately 500km south of Península Valdés wintering grounds and the species seems to be recovering in the area[82].
Locations of primary feeding grounds for most southern hemisphere right whale populations are not well understood. Only recently it has been established that at least some of the Southern right whales breeding off South Africa remain alongshore towards the Northwest, where they spend summer feeding on copepods, a previously undescribed phenomenon for coastal waters of the Southern Hemisphere [83],[84].
There were open-ocean seasonal concentrations as recorded in Yankee whaling logbooks and charts[85], but these areas, in particular those in the vicinity of the Rio Grande Rise and southwards, have not been properly surveyed mainly due to lack of material means. This is a very illustrative example of how much needs to be done in scientific research in international waters to better understand and manage whale species in the South Atlantic – something that will rely heavily on international cooperation which the SAWS can promote.

Pygmy Right Whale, *Caperea marginata*

The pygmy right whale remains to date one of the least known cetaceans. Being the smallest of the baleen whales, it is found exclusively in the Southern Hemisphere and it probably has a circumpolar distribution, with South Atlantic records mostly based on strandings from South Africa and several parts of Eastern South America. It is probably restricted to temperate and subtropical waters, but migration patterns – if any – or seasonal movements are unknown. There is no information at all on its population sizes or conservation status.

Humpback Whale, *Megaptera novaeangliae*

Humpback whales are recorded off the eastern coast of South America mainly from northeastern Brazil (~5°S) to the coast of Rio de Janeiro (~21°S)[86,87]. The Abrolhos Bank (Lat. 19° 30' S to Lat. 16° 40' S) constitutes one of the most important breeding grounds for the species in the Western South Atlantic[88,89]. An increasing number of whales, including mother-calf pairs, has been observed southward and northward of Abrolhos Bank, suggesting that the recovering population may be moving again to areas previously used for breeding and calving prior to the species' exploitation[90,91]. Recent aerial and ship surveys estimated

[82] Iñiguez, M.A.; Belgrano, J.; Tomsin, A.; de Haro, C.; Gribaudo, C. and Tossenberger, V. 2003. Sighting and stranding of southern right whales (*Eubalaena australis*) off Santa Cruz, Patagonia Argentina (1986-2003). Paper SC/55/BRG8.
[83] Rowntree, V.J, Payne, R.S. and D.M. Schell. *op. cit.*
[84] Best, P. B.; Mate, B.; Barendse, J.; Elwen, S.; Thomton, M.; Verheye, H. 2003. A Summer Feeding Ground for Right Whales (*Eubalaena australis*) on the West Coast of South Africa. *In:* Abstracts, *15th Biennial Conference*, 14-19 December, Greensboro, North Carolina, USA. p. 17.
[85] Townsend, C.H. 1935. The distribution of certain whales as shown by logbook records of American whaleships. *Zoologica,* New York (XIX)*:*1-50.
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[90] Más Rosa, S.; Baracho, C.G.; Marcovaldi, E. & Engel, M.H. 2002. Dados preliminares sobre a reocupação de antiga área de reprodução de baleias jubarte (Megaptera novaeangliae) no litoral norte da Bahia, Brasil. Anales de la 10ª. Reunión de Trabajo de Especialistas em Mamífefros Acuáticos de América Del Sur y 4º. Congreso de la SOLAMAC, Viña Del Mar.
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population size in Bahia and Espírito Santo states (12-20°S) (N=2291, CV=0,45)[92] and in northeastern Brazil (5-12°S) (N=628, CV=0,33)[88]. A combination of these two estimates, corrected for sightability bias, suggested that the stock size in 2002 was nearly 4500 whales (CV=0.27)[93]. This population was estimated to be at about 25 to 30% of its pre-exploitation population size, suggesting that conservation measures are still required to ensure its recovery[95].

Mitochondrial DNA analyses[94], photoidentification studies[95] and telemetry[96] suggest that the correspondent feeding area of the Brazilian humpback whales isn´t located in the surroundings of the Antarctic peninsula, but near the South Georgia and South Sandwich islands.

The song of the Brazilian Humpback Whale population (*Megaptera novaeangliae)* was studied at Abrolhos Bank[97].Similarities in song production between humpback whales from Brazil and Gabon suggests that these populations could experience some degree of mixing; possibilities include a significant overlap in feeding grounds leading to regular interchange between the two breeding areas, or Gabon and Brazil being way-points on the same migratory route[98]. However, recent genetic studies have provided information on stock relationships for humpback whales in the southwestern and southeastern Atlantic Ocean[99,100] showing that animals from west South Africa are significantly different from Brazil and Gabon.

Humpback whales are seasonally observed in South Africa and the west coast of the African continent, in Angola and Gabon. The coastal waters of Gabon are the most important wintering area off equatorial west Africa for humpback whale breeding, calving and nursing[101].

At the Republic of São Tomé and Príncipe, an archipelagic nation, preliminary research indicates that humpback whales are present in austral winter and spring. Plans are being made to study these whales genetically and acoustically to determine stock affiliation[102].

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[93] Zerbini, A.N. 2004. Status of the Southern Hemisphere humpback whale breeding stock A: preliminary results from a Bayesian assessment. Paper SC/56/SH17 presented at the 56th Meeting of the International Whaling Commission Scientific Committee.

[94] Engel, M.H. Caracterização e Variabilidade Genética baseada no DNA Mitocondrial e Sexagem Molecular da População de Baleias Jubarte, *Megaptera novaeangliae*, no Banco dos Abrolhos, Bahia, Brasil. M.Sc. Thesis, Pontifícia Universidade Católica do Rio Grande do Sul (PUC/RS), Porto Alegre, RS, Brasil.26 pp.

[95] Stevick, P.T.; Aguayo, A.; Allen, J.; Avila, I.C.; Capella, J.; Castro, C.; Charter, K.; Dalla Rosa, L.; Engel, M.H.; Felix, F.; Florez-Gonzalez, L.; Freitas, A.; Haase, B.; Llano, M.; Lodi, L.; Munoz, E.; Olavarria, C.; Secchi, E.; Scheidat, M. and Siciliano, S. 2004. Migrations of individually identified humpback whales between the Antarctic Península and South America. *J. Cetacean Res. Manage.* 6 (2) 109-113.

[96] Zerbini, A.N., Andriolo, A., Heide-Jørgensen, M.P., Pizzorno, J.L., Maia, Y.G., Vanblaricom, G.R., Demaster, D.P., Simões-Lopes, P.C., Moreira, S. and Bethlem, C.P. 2004. Identification of a summering ground of humpback whales from Brazil: Preliminary results from satellite telemetry. Paper SC/56/SH1

[97] Arraut. E. M. and Vielliard, J.M.E. 2004. The song of the Brazilian population of Humpback Whale *Megaptera novaeangliae*, in the year 2000: individual song variations and possible implications. An. Acad. Bras. Ci. 76(2): 373-380.

[98] Darling, J.D. and Sousa-Lima, R.S. 2001. Comparison of Humpback Whale Songs from Gabon and Abrolhos Bank, Bahia, Brazil. *In:* Abstracts, *14th Biennial Conference on the Biology of Marine Mammals,* 28 November – 3 December, Vancouver, BC, Canada. p. 40.

[99] Rosenbaum, H.C.; Best, P.B.; Findlay, K.P.; Engel, M.H.; Pomilla, C.; Razafindrakoto, Y.; Morete, M.E.; Freitas, A.C.; Baker, C.S.; Jenner, C.; Jenner M-N and Bannister, J. 2000. Mithocondrial DNA variation among humpback whales from the wintering grounds in the South Atlantic and Southwestern Indian Oceans. Paper SC/52/IA11.

[100] Rosenbaum, H.C.; Best, P.B. and Pomilla, C. 2001. A preliminary analysis of mtDNA variation among humpback whales of the Southeastern Atlantic Ocean from the wintering grounds along the coast of West Africa. Paper SC/53/IA32

[101] Rosenbaum, H.C.; Ersts, P.;Razafindrakoto,Y.; Sounguet, G.; Pomilla, C.; Ngouessono, S. and White, L. 2002. Population characteristics, distribution, and relative abundance of humpback whales off the coasts of Madagascar and Gabon: an update on recent and planned research. Paper SC/54/H20

[102] Carvalho, I.; Brito, C.; Reiner, F. 2003. Group Types and Surface Activities of Humpback Whales Breeding in S. Tomé and Príncipe, Gulf of Guinea. *In:* Abstracts, *15th Biennial Conference*, 14-19 December, Greensboro, North Carolina, USA. p. 30.

Photo-identification data obtained from humpback whales in Brazil is held in the Antarctic Humpback Whale Catalog[103] to facilitate comparison with other regions of the Southern Hemisphere and promote cooperative research[104]. These data are being compared with that obtained from Gabon, as part of the Indo-South-Atlantic Humpback Whale Consortium/ISACH[105].

Common Minke Whale, *Balaenoptera acutorostrata*

Two species of minke whales – the common and the Antarctic minke whale - migrate from Antarctic waters and are regularly found along the eastern coast of South America[106, 107, 108].

[103] Allen, J., Rock, J, Carlson, C., Harvey, M. 2001. Antarctic Humpback Whale Catalogue: Description and Summary. *In:* Abstracts, *14th Biennial Conference on the Biology of Marine Mammals*, 28 November – 3 December, Vancouver, BC, Canada. p. 5..

[104] Allen, J., Stevick, P., CarIson, C, Harvey, M. 2003. Status of the Antarctic Humpback Whale Catalogue. *In:* Abstracts, *15th Biennial Conference*, 14 -19 December, Greensboro, North Carolina, USA. p. 4-5.

[105] Pacheco de Godoy, M.L.M.; Collins,T.; Ersts, P.; Engel, M.H. and Rosenbaum, H.C. 2004. Preliminary photographic comparisons of humpback whales (*Megaptera novaeangliae*) from two South Atlantic wintering grounds. Paper SC/56/SH8

Baldas, M.I. and Castello, H.P. 1986. Sobre el hallazgo de ejemplares juveniles de ballena minke, *Balaenoptera acutorostrata*, en el estuario del Rio de la Plata y sur de Brasil. I Reunion de Trabajos de Expertos en Mamíferos Acuáticos de América del Sur. 25 - 29 Junio 1984, Buenos Aires. Actas. pp. 33-34. 247pp.

Stranding records indicate the species may not be rare in Brazil[109], where it is commonly found in the winter and spring[119]. During austral summer few sightings were made at headlands near Cape Frio in Southeastern Brazil, where apparent feeding behavior has been observed in conjunction with aggregations of sardines and squid[110]. This may indicate the importance of the region´s upwelling for feeding baleen whales along their yet undetermined migratory pathways along the Western South Atlantic. Interactions with humpback whales and humans were recorded in this region[111].
In medium and low latitudes, common minke whales seem to inhabit coastal waters, usually over the continental shelf. Their ecology is poorly known. There is no current information on population size and trends in the wintering grounds off eastern South America. The species feed on small crustaceans and small pelagic schooling fishes[112].

Antarctic Minke Whale, *Balaenoptera bonaerensis*

The Antarctic minke whale spends much of the year in waters around the Antarctic, migrating to lower latitudes in winter. This species is larger and present different colour patterns than common minke whales.
Antarctic minke whales occur off the eastern coast of South America in winter and spring, being usually found beyond the continental shelf in waters deeper than 1000m[113]. The northeastern coast of Brazil is considered a putative breeding ground for the species[114]. From 1966 to 1985 nearly 15,000 whales were taken off NE Brazil from a coastal whaling station located in Costinha (~7^{o}S), Paraíba State[130, 115]. This station was closed after the moratorium on whaling. Recent surveys have shown that the population is relatively common in this area, where breeding behaviour has been observed[116].
Little is known about the about the social structure or behavior of *B. bonaerensis*, however this species frequently travels alone or in small groups, but also sometimes gathers in large feeding aggregations. Evidence suggests that the populations are segregated by age, sex, or reproductive condition, even during migrations[117]. Antarctic minke whale migrations between the eastern coast of South America and the IWC management Areas II and III have been confirmed by marking experiments, showing that this population feeds in the Antarctic Sector of the South Atlantic[130].

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[107] Zerbini, A. N., Secchi, E. R., Siciliano, S., and Simões-Lopes, P. C. 1996. The dwarf form of the minke whale, *Balaenoptera acutorostrata Lacepede*, 1804, in Brazil,. *Rep. Int. Whal. Commn*. **46**: 333–340.
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[112] Secchi, E.R.; Barcellos, L.; Zerbini, A.N. and Dalla-Rosa, L. 2003. Biological observations on a dwarf minke whale, ***Balaenoptera acutorostrata,*** caught in southern Brazilian waters, with a new record of prey for the species. Submitted to ***Latin American Journal of Aquatic Mammals* 2(2): 109-115.**
[113] Williamson, G.R. 1975. Minke whales off Brazil. *Sci. Rep. Whales Res. Inst.* 27: 37-59.
[114] IWC. 1991.Report of the Sub-Committee on Southern Hemisphere minke whales. *Rep. Int. Whal. Commn.* 41: 113-31.
[115] Horwood, J. 1990. The Biology and Exploitation of Minke Whales. CRC Press, Boca Raton, 238pp.
[116]Andriolo,A.; da Rocha, J.M.; Zerbini, A.N.; Simões-Lopes, P.C.; Moreno, I.B.; Lucena, A.; Danilewicz, D.; Bassoi, M. Distribution and Relative Density of Large Whales an a Former Whaling Ground off Eastem South America.
[117] Reeves, R.R.; Stewart, B.S.; Clapham, P.J.; Powell, J.A. 2002. Guide to Marine Mammals of the World. National Audubon Society/Alfred A Knopf.

The stock size and population identity of whales wintering off Brazil is poorly known, and population status, after predation of both minke species by commercial whaling in the late 20th century, is currently unknown. The IWC Scientific Committee remains unable to reach agreed estimates for Southern Hemisphere minke whales.

Sei Whale, *Balaenoptera borealis*

This species occurs in all nonpolar waters both in coastal and oceanic areas. Biology, population size and conservation status are largely unknown for most of its range. In the past the species was hardly distinguished in whaling records from other rorquals and therefore the true impact of industrial whaling on it is very difficult to assess. It is probably highly depleted throughout the Southern Hemisphere, due to the abuses of commercial whaling.
The sei whale distribution along its breeding grounds is broadly similar to blue and fin whales[118]. Off Western South Africa the species was found most frequently off the continental shelf[119], and its South Atlantic populations were heavily affected during whaling operations along both continental coasts. Recent sightings of the species are rare and some were recently recorded in Southern Patagonia[120], where it was also hunted and severely depleted.
Sei whales the main target of whalers operating at Costinha whaling station in NE Brazil. From at least 1947 to 1965 nearly 3600 whales were taken. Data collected from catcher boats in the latest years of whaling operations (1981-1985) and, more recently, during sighting surveys conducted from 1998 to 2001 have shown that sei whales are still very rare in their former whaling grounds off NE Brazil and suggest that this population has not shown any recovery[121, 122]. The species was also taken further south, at a whaling station operating in Cabo Frio, where the current occurrence of sei whales is not known.
The species preys mainly on krill and copepods, with small fish occasionally being part of its diet. Unlike other species, sei whales apparently change their concentration areas over time[123], thought it is generally believed that they make seasonal movements between high and low latitudes as do other large whales. Research on this species is frankly opportunistic and very little has been done in recent years to elucidate its status; there is no reliable estimate at all for the number of remaining sei whales in the world´s oceans.

Bryde´s Whale, *Balaenoptera edeni*

Although Bryde's whales may present latitudinal movements[124], they do not migrate to Antarctic waters and therefore feed and reproduce in tropical to warm temperate waters. At least two different stocks – onshore and offshore – are found off western Africa and, possibly, eastern South America[125]. Both populations differ from another group in Eastern South

[118] Gambell, R. 1985. Sei whale *Balaenoptera borealis* (Lesson, 1828). Pp. 155-170. *In* S.H. Ridgway and R. Harrison, eds. Handbook of Marine Mammals, Volume 3. The Sirenians and Baleen Whales. Academic Press.
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[120] Argentina Progress Report to the IWC, 2004/2005.
[121] Horwood, J. *op. cit.*
[122] Antonelli, H.H., Lodi, L., and Borobia, M. 1987. Avistagens de cetáceos no período 1980 a 1985 no litoral da Paraíba, Brasil. Segunda Reun. Trab. Esp. Mam. Aquat. da Am. Do Sul. 4-8 de agosto de 1986, Rio de Janeiro, p. 114.
[123] Bastida, R. and Rodriguez, D. 2003. Mamíferos Marinos de Patagônia y Antártida. Buenos Aires, Vazquez Mazzini, 208p.
[124] Best, P.B. 1996. Evidence of migration by Bryde's whales from the offshore population in the Southeast Atlantic. *Rep. Int. Whal. Commn.* 46:315-322.
[125] Best, P.B. 1977. Two allopatric forms of Bryde's whale off South Africa. *Rep. Int. Whal. Commn. (Special Issue 1)*:10-38.

Africa, which possibly constitute a third (pelagic) stock[126].
Bryde's whales were taken by the whaling stations operation in Costinha and Cabo Frio, Brazil. The total number of whales taken is unknown because this species was recorded together with the sei whale.
Bryde's whales are regularly found off the coast of Brazil but the bulk of the sightings come from the Southern and Southeastern coasts, where observation effort is larger. In this region, seasonal abundance seems to be higher in the summer and fall and seems to be correlated with the spawning season of schooling fishes such as sardines[127].
Recent regular sightings of Bryde´s whales off Southeastern Brazil indicate that a resident population does occur around the islands found there, especially in the vicinity of the Laje de Santos (Santos Rocks) Marine State Park (25 nautical miles off the Southeastern Brazilian coast) and may extend its longitudinal movements towards the east[128]. Recent sightings have been recorded in the region at the 3000m isobath and breaching behavior was observed for the first time near the 1200m isobath[129]. Most sightings recorded refer to *Balaenoptera edeni*, but the possible occurrence of *Balaenoptera brydei* needs to be investigated. Population structure and current stock size of these whales off Brazil is unknown and a detailed regional survey project is under way aiming to assess the actual status and distribution of this population.

Blue Whale, *Balaenoptera musculus*

One of the icons of the greed and irresponsibility of the whaling industry, the largest mammal species on Earth was almost entirely wiped out of all oceans. It was originally a wide-ranging species occurring from polar to tropical waters. Krill is its primary food source, though copepods and amphipods can also be preyed upon by blue whales. Its taxonomy remain subject to debate, but it is generally accepted that the so-called pygmy blue whale (*Balaenoptera musculus brevicauda*) is significantly different from the "true" blue whales to warrant separate taxonomic status.
It is shocking that, like in so many other cases where the whaling industry has so heavily pursued whale species and pretended to know enough to "sustainably exploit" them, very little is known about the social structure of blue whales (and, to be sure, of most other cetaceans). There is insufficient information on the areas of concentration for breeding populations of blue, fin and sei whales. Nevertheless, it has been accepted that blue and fin whales disperse in open tropical waters of the Southern Hemisphere, generally around 20ºS[130,131]. Both species were relatively common along the western African coast[132] but seemed to be proportionally rare off the South American coast, where blue whales were exterminated by commercial whaling until the 1960´s. No sightings of live blue whales have been confirmed in Brazil over the last four decades. There is not a proper estimate of surviving blue whales in the South Atlantic, and numbers for the entire Southern Hemisphere

[126] Best, P.B. 2001. Distribution and population separation of Bryde's whale *Balaenoptera edeni* off southern Africa. *Mar.Ecol.Prog.Ser.* 220: 277-289.
[127] Zerbini, A.N., Secchi, E.R., Siciliano, S. and Simões-Lopes, P.C. 1997. A Review of the Occurrence and Distribution of whales of the genus *Balaenoptera* along the Brazilian coast. *Rep. Int. Whal. Commn.* 47: 407-417.
[128] CEMAR – Marine Conservation Research Center / S.Paulo State Environmental Dept. 2003. Preliminary results from two sighting surveys along the Marine Protected Areas on the coast of S.Paulo State (Unpublished data).
[129] Gonçalves, L.R., Potiens, T.N., Augustowski, M. and Andriolo, A. 2004. Registros comportamentais de baleias-de-Bryde (*Balaenoptera edeni* Anderson, 1878) no Atlântico Sul Ocidental. *In :*XXII Encontro Anual de Etologia. Novembro de 2004. Campo Grande.
[130] Yochem, P. and Leatherwood, S. 1985. Blue whale *Balaenoptera musculus* (Linnaeus, 1758). Pp. 193-240. *In* S.H. Ridgway and R. Harrison, eds. Handbook of Marine Mammals, Volume 3. The Sirenians and Baleen Whales. Academic Press.
[131] Gambell, R. 1985. Fin whale *Balaenoptera physalus* (Linnaeus, 1758). Pp. 171-192. *In* S.H. Ridgway and R. Harrison, eds. Handbook of Marine Mammals, Volume 3. The Sirenians and Baleen Whales. Academic Press.
[132] Best, P.B. 1994. A review of catch statistics for modern whaling in Southern Africa, 1908-1930. *Rep. Int. Whal. Commn.* 44:467-85.

could be as low as few hundreds.

Fin Whale, *Balaenoptera physalus*

Second largest species of cetacean, the fin whale originally had a wide distribution much like that of the blue whale, encompassing all waters from the polar regions to the Equator. Just like the blue whale, however, the species was recklessly slaughtered by industrial whaling, with more than 700,000 animals killed in the Southern Hemisphere alone, and its current numbers are unknown. Its breeding and feeding areas are also not known. The species feeds on krill and Clupeidae fish. Only three and 84 whales were taken in Costinha and Cabo Frio respectively, suggesting that the species is rare off Brazil.Strandings have occurred widely along the eastern seaboard of South America[133], but in relatively small numbers. Occasionally they are seen associated with blue whales, and interspecific mating has been recorded. The extent to which this may be due by the drastic reduction in numbers of both species by commercial whaling, therefore making it harder to find intraspecific mates, is open to discussion.

ODONTOCETES

Sperm Whale, *Physeter macrocephalus*

The sperm whale, *Physeter macrocephalus*, is relatively well known in comparison with other large cetaceans, and has been studied in many parts of the world. Breeding and raising of young take place in warm waters in harem groups, while old males and groups of young males migrate toward cooler waters in summer. In the Southern Hemisphere, old males reach Antarctic waters, but it has been thought that bachelor herds seldom reach 50° S. In the South Atlantic Ocean, female and young male sperm whales are only found up to the Subtropical Convergence (approximately 40ºS). In Tierra del Fuego, Argentina, systematic beach surveys for stranded animals revealed more than 50 stranded sperm whales in an 11-year period, all of them males. All were found in or near Bahía San Sebastián (53° S 68° W), which with its imperceptibly sloping beaches and high tides (10.6 m) is a natural trap. Further north, sperm whales have been recorded from strandings all along the Brazilian coast[134,135,136] and observed during oceanic surveys from 29^{o}S to 34^{o}S being the most sighted species in the surveyed area[137]. In Southern Brazil, groups of up to 17 individuals have been observed along the fringes of the continental shelf in depths of 850 to 1550m[138].

[133] Bastida, R. and Rodriguez, D. *op.cit.*

[134] Danilewicz, D. S., Ott, P. H., Moreno, I. B., Martins, M. B., Oliveira, L. R., and Caon, G. 1998. Monitoramentos de praia no litoral norte do Rio Grande do Sul uma revisão dos registros de mamíferos marinhos entre 1991 e 1998. 8ª Reunião de Especialistas em Mamíferos Aquáticos da América do Sul, Abstracts. p. 62. Recife, Brasil.

[135] Moreira, L. M. P., Siciliano, S., and Alves, A. Registros de cetáceos para o litoral do Espírito Santo, Brasil 1992-1994. 1994. Anais da 6a Reunião de Trabalho de Especialistas em Mamíferos Aquáticos da América do Sul, Abstracts, p.116. Florianópolis, Brasil.

[136] Reis, M. S., Reis, L. W. D., Luckesi, S. V., and Pereira, C. F. R. 1996. Cetáceos de ocorrência no litoral do estado da Bahia, Brasil. 7a. Reunion de trabajo de especialistas en mamíferos acuáticos de América del Sur. Abstracts, s/n. Viña del Mar, Chile.

[137] Pinedo, M.C.; Polacheck, T.; Barreto, A.S.; Lammardo, M.P. 2002. A note on vessel of opportunity sighting surveys for cetaceans in the shelf edge region off the southern coast of Brazil. Journal Of Cetacean Research And Management, Cambridge, v. 4, n. 3, p. 323-329.

[138] Zerbini, A.N.; Secchi, E.R., Bassoi, M.,Dalla Rosa, L.,Higa, A., Sousa, L.,Moreno, I.B., Möller, L.M., and Caon, G. 2004. Distribuição e Abundância de Cetáceos na Zona Econômica Exclusiva da Região Sudeste-Sul do Brasil. São Paulo, Instituto Oceanográfico/USP, 40. (Série Documentos REVIZEE: Score Sul)

Pygmy Sperm Whale, *Kogia breviceps*

The pigmy sperm whale inhabits tropical and temperate seas worldwide. Its habits are markedly oceanic, and the species distribution and abiological aspects have been mainly studies through strandings, of which several have occurred along the Northeastern Brazilian coast and parts of South Africa. Many recorded strandings of the species are from mothers and calves[139].It exhibits opportunistic feeding behaviour targeting small and medium-sized squid and deep sea fish and crustaceans, possibly found along the continental shelves beyond 200m deep. The species also shows tolerance towards a larger range of water temperatures than *K. sima*, facilitating long distance movements.Bycatch of the species has been reported off Brazil[140].

Dwarf Sperm Whale, *Kogia sima*

Dwarf sperm whales, like the pygmy sperm whale, occur worldwide in the tropics and subtropics. They are apparently more coastal than *K. breviceps*, probably inhabiting the edges of continental shelf and slopes, with no evidence for migration[141], and in African waters the species can be observed year-round[142]. Deep-sea cephalopods, crustacean and fish of several deepwater species are among its food items. Group sizes so far observed are usually small, not surpassing ten animals[143].

Cuvier´s Beaked Whale, *Ziphius cavirostris*

Cuvier's beaked whale is known to be the most cosmopolitan of the beaked whales, occurring in all oceans and most seas[144]. In the Southwest Atlantic records of at least 37 specimens are known, from Fernando de Noronha, Brazil, to Tierra del Fuego, Argentina. Although most of these records occurred in Argentina, 12 have been reported for Brazilian waters[145], widely distributed along the Brazilian coastline. The species is little known in terms of its biology, but data from strandings indicate that if feeds on deep-sea squid, crustaceans and echinoderms. The species appears to be particularly vulnerable to acoustic trauma and there have been several mass strandings of Cuvier's Beaked Whales coincident with military exercises involving the use of very loud, low-frequency sonar[146,147].

Arnoux´s Beaked Whale, *Berardius arnuxii*

[139] Carwardine, M. 1995. Whales, Dolphins and Porpoises. Dorling Kindersley, London, 257p.

[140] Zerbini A.N., Kotas, J.E. 2001. A note on cetacean bycatch in pelagic driftnetting off southern Brazil. *Rep. Int. Whal. Comm.* 48*:* 519-524.

[141] Reeves, R.R., Stewart, B.S., Clapham, P.J., Powell, J.A. and P. Folkens. 2002. Guide to the Marine Mammals of the World. Alfred A. Knopf, New York, 527p.

[142] Duguy R. 1994. *Kogia breviceps* (de Blainville, 1838) - Zwergpottwal. *In*: Niethammer J, and Krapp F (eds.) Handbuch der Säugetiere Europas. Band 6: Meeressäuger. Teil 1B: Wale unbd Delphine 2. Aula-Verlag, Wiesbaden, 652p.

[143] Jefferson T.A., Leatherwood, S., Webber, M.A. 1993. FAO Species Identification Guide: Marine Mammals of the World. UNEP/ FAO, Rome, 320p.

[144] Heyning, J.E. 1989. Cuvier's beaked whale *Ziphius cavirostris* G. Cuvier, 1823. In: S.H. Ridgway & R. Harrison (eds). Handbook of Marine Mammals, vol. 4. Academic Press, London, Chap. 11:289-308.

[145] Pinedo. M.C.; Lammardo, M.P. and Barreto, A.S. 2001. Review of *Ziphius cavirostris*, *Mesoplodon grayi* and *Lagenodelphis hosei* (Cetacea: Zipihiidae and Delphinidae) in Brazilian waters, with new records from Southern Brazil. Atlântica 23: 67-76.

[146] Frantzis, A. 1998. Does acoustic testing strand whales? *Nature* 392: 29.

[147] Rowles, T., Ketten, D., Ewing, R., Whaley, J., Bater, A. and Gentry, R. 2000. Mass stranding of multiple cetacean species in the Bahamas on March 15–17, 2000. Paper SC/52/E28.

This species has a circumpolar distribution and, reaching up to 10m in length, is the largest of the Ziphiidae together with *B. bairdii* from the Northern Hemisphere. It is one of the least known cetacean species in terms of its biology and ecology; other than feeding on squid and appearing to gather in groups of up to ten animals, almost nothing else is known. The species has a circumpolar distribution from the ice edge to approximately 35^{o} S, though a lower latitude stranding was recorded in Southeastern Brazil[148]. Stranding records of Arnoux's beaked whales were common in late spring or early summer in higher latitudes. There is evidence that the species could move onshore during summer months[149].

Shepherd´s Beaked Whale, *Tasmacetus shepherdi*

This is an extremely rare species, known only from a little more than twenty stranded specimens and virtually no information about its behavior and actual distribution. Strandings records indicate that the species may be circumpolar distribution. Five strandings were recorded from Argentina[150]. Putative sightings of live individuals were reported from the western South Atlantic (53°45'S, 42°30'W) and off New Zealand[151].

Southern Bottlenose Whale, *Hyperoodon planifrons*

The Southern Bottlenose whale is distributed throughout the Southern Hemisphere from the floating ice limits in Antartica to approximately 30^{o} S. Its habits are mainly oceanic, and it is most common beyond the continental shelf and over submarine canyons, in water deeper than 1,000m. It is rarely found in water less than 200m deep. During summer, this species is most frequently seen within about 100km of the Antarctic ice edge, where it appears to be relatively common[152]. It presence in the South Atlantic is evidenced by strandings from both the South American and African coasts. Large cephalopods constitute its dietary item. There are no population estimates for the species

Andrew´s Beaked Whale, *Mesoplodon bowdoini*

Andrew´s beaked whales are only known from fewer than 40 strandings in the Southern Hemisphere, most of which have occurred in Southern Australia and New Zealand/ nevertheless, the species has been recorded in the South Atlantic both in the Malvinas (Falkland) islands and Tierra del Fuego between 1988 and 2002[153,154]. A stranding has also been recorded in the archipelago of Tristan da Cunha.

Blainville´s Beaked Whale, *Mesoplodon densirostris*

This species is probably the most common beaked whale and the one with the widest distribution, reaching from both subtropical areas in the northern and southern hemispheres

[148] Siciliano, S. and Santos, M.C.O. 2003. On the occurrence of the Arnoux's beaked whale (*Berardius arnuxii*) in Brazil. *J. Mar. Biol. Ass. U.K.*, 83, 887-888.
[149] Ross, G.J.B., 1984. The smaller cetaceans of the south coast of Southern Africa. *Annals of the Cape Province Museum, Natural History* **15**, 173-410.
[150] Bastida, R. and Rodriguez, D. *op. cit.*
[151] Rice, D.W. 1998. Marine Mammals of the World – Systematics and Distribution. Society for Marine Mammalogy Special Publication 4, 231p.
[152] Kasamatsu F. and Joyce, G.G. 1995. Current status of Odontocetes in the Antarctic. *Antarctic Science* **7**(4): 365-379.
[153] A. Baker, pers. comm.
[154] Goodall, R.N.P., Boy C.C., Pimper, L.E. and Macnie, S.M. 2004 . Range estensions and exceptional records of cetaceans for Tierra del Fuego. Abstracts 11 Reunion de Trabajo de Especialistas en Mamiferos Acuaticos de America del Sur y 5 Congreso SOLAMAC, Quito, Ecuador.

into the tropics, and is also the only *Mesoplodon* which has been regularly observed at sea, both in the North Pacific and the Caribbean[155]The species seems to avoid coastal areas and stay in offshore areas where depths are over 500m. No reliable population estimates exist. As with other cetacean species, beaked whales also suffer from the contamination of the oceans, as evidenced by the ingestion of plastic debris found in a stranded specimen of *M. densirostris* in Brazil[156].

Gervais´ Beaked Whale, *Mesoplodon europaeus*

Gervais´ beaked whales inhabit warm temperate and tropical waters of the North and South Atlantic oceans, with most confirmed records being from strandings, with very few live animal sightings[157]. The southernmost confirmed record of the species in the South Atlantic is from Southeastern Brazil[158]. Three other confirmed records in the South Atlantic are from Ascension Island[159]. There is very little information on the species, virtually nothing about its actual behavior and no estimates for population size.

Gray´s Beaked Whale, *Mesoplodon grayi*

Gray's beaked whale occurs mainly in temperate waters of the southern oceans. At least 10 specimens have been reported from the Southwest Atlantic, almost all of them from Argentina.There are also records for the extreme south of Brazil[160], where its distribution may follow the colder waters of the Malvinas (Falklands) Current. Though there have been live animal sightings, virtually nothing is known about its ecology and behavior.

Hector´s Beaked Whale, *Mesoplodon hectori*

With very scarce information available about its actual distribution, strandings indicate that Hector´s beaked whale may have a circumpolar distribution in the Southern Hemisphere, with occurrence confirmed in the South Atlantic through records from Argentina, South Africa, and Southern Brazil which apparently represents the northernmost limit of the species[161]. It is probably an open sea species and its status remains unknown.

Layard´s Beaked (Strap-toothed) Whale, *Mesoplodon layardii*

Layard´s beaked whales occur in temperate and cold waters Strandings in the South Atlantic were recorded in Southern Argentina, Uruguay, Southern Brazil[162], Malvinas (Falkland)

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[155] Pitman, R. L. 2002. Mesoplodont whales. In: W. F. Perrin, B. Würsig & J. G. M. Thewissen (eds.) *Encyclopedia of Marine Mammals*, pp. 738–742 Academic Press, San Diego.

[156] Secchi, E.R. and Zarzur, S. 1999. Plastic debris ingested by a Blainville's beaked whale, Mesoplodon densirostris, washed ashore in Brazil. *Aquatic Mammals* **25** (1):21-24.

[157] Pitman, R.L. *op. cit.*

[158] Santos, M.C.O.; Zampirolli, E.; de Castro, A.F.V. and Alvarenga, F.S. 2003. A Gervais' beaked whale (*Mesoplodon europaeus*) washed ashore in southeastern Brazil: extra limital record? *Aquatic Mammals* **29.3**, 404-410.

[159] Norman, S. A. & Mead, J. G. (2001) *Mesoplodon europaeus. Mammalian Species* **688,** 1–5.

[160] Soto J.M.R. and Vega, S.S. 1997 First record of Gray's beaked whale, Mesoplodon grayi Haast, 1876 (Cetacea, Ziphiidae) from Brazil, with reference to osteology and a review of the ziphiids citations in Brazilian waters. *Biociencias* **5** (1): 69-89.

[161] Zerbini, A. N. and E. R. Secchi. 2001. Occurrence of Hector's beaked whale, *Mesoplodon hectori*, in Southern Brazil. *Aquatic Mammals* **27**(2): 149-153.

[162] Pinedo, M.C.; Barreto, A.S.; Lammardo, M. P.; Andrade, A.L. V.; and Geracitano, L. 2002. Northernmost records of the spectacled porpoise, Layard's beaked whale, Commerson's dolphin and Peale's dolphin in the southwestern Atlantic Ocean. *Aquatic Mammals* **28**(1):32-37.

Islands, Namibia and South Africa[163,164]. Analyses of stomach contents from several strandings indicate that the species' food preference consists of oceanic squid[165].

True´s Beaked Whale, *Mesoplodon mirus*

True's beaked whales are rare animals (with only around 20 records worldwide) and their distribution is a puzzle for researchers. Records have been made in the North Pacific and Indian Ocean, and strandings in the Cape Province, South Africa, indicate that the species probably reaches the eastern South Atlantic. Indications are that the species is restricted to latitudes higher than 30^{o} on both hemispheres. They are probably pelagic animals which feed on squid, but nothing else is known about their habits, nor there are any population estimates.

Franciscana, *Pontoporia blainvillei*

Despite research and monitoring efforts over many years, the species is still largely unknown in regard to its actual population sizes, status and rates of decrease due to incidental catch[166], and recent initiatives to provide international coordination for research and management initiatives must be encouraged and supported. Total abundance has been estimated as near 20,000 franciscanas for the whole Rio Grande do Sul, Brazil and Uruguay coastal waters, considering the 30m isobath as the offshore border, and about 2.1 - 10.8% of the population may be removed each year by fisheries in the region[167]

An apparently resident inshore population of franciscanas was discovered at Babitonga Bay, Southern Brazil, where it coexists with *Sotalia fluviatilis*[168], an unique phenomenon for this otherwise open-water species.

Offshore distribution of the species in Southern Brazil seems to be limited by the 35m isobath[169]. Other factors affecting distribution can be related to limiting habitat characteristics such as river discharge, which offers food resources, protection against predators and maintenance of the water temperature; ocean floor morphology, especially depth; presence of predators and trophic competitors. These factors may account for the observed discontinuity in the population along southern and southeastern Brazil[170].

Tucuxi, *Sotalia fluviatilis*

Tucuxi is a species restricted to eastern South America and the Caribbean coasts of Central America. It penetrates the Amazon River basin and reaches up to Colombia, Ecuador and Peru, and the lower reaches of the Orinoco river system. A long debate has survived among

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[163] Rice, D.W. *op. cit.*

[164] Mead, J. 1989.Beaked whales of the genus Mesoplodon. In: S.H. Ridgway and R. Harrison (eds). *Handbook of Marine Mammals*. Vol. **4,** *River Dolphins and the Larger Toothed Whales*. Pp. 349-430. Academic Press.

[165] Sekiguchi, K., Klages, N.T.W. and Best, P.B. 1996. The diet of strap-toothed whales (*Mesoplodon layardii*). *Journal of Zoology (London)* **239**(3): 453-463.

[166] Secchi, E. R. & Wang, J.Y. 2002. Assessment of the conservation status of a Franciscana (Pontoporia blainvillei) stock in the Franciscana Management Area III following the IUCN Red List Process. LAJAM 1(1): 183-190, Special Issue 1.

[167] Secchi E.R., Ott, P.H., Crespo, E.A., Kinas, P.G., Pedraza, S.N. and Bordino P. 2000. Abundance estimation of franciscana dolphin, Pontoporia blainvillei, stock from aerial surveys. Paper IWC/53/SC submitted to the IWC Scientific Committe sub-committee on Small Cetaceans.

[168] Cremer, M. J.; Hardt, F. A.; Tonello, A.J. 2001. The Relative Abundance of Simpatric Populations of *Pontoporia blainvillei* and *Sotalia fluviatilis guianensis* in the Babitonga Bay, South Coast of Brazil. *In:* Abstracts, *14th Biennial Conference on the Biology of Marine Mammals*, 28 November – 3 December, Vancouver BC, Canada. p. 49.

[169] Danilewicz, D.I..; Secchi, E.R.; Ott, P.R..; Moreno, I.B.; Bassoi, M. 2001. Habitat Use Patterns by the Franciscana Dolphin, *Pontoporia blainvillei*, in Rio Grande Do Sul, Southern Brazil, as Revealed by Incidental Catch Data. *In:* Abstracts, *14th Biennial Conference on the Biology of Marine Mammals*, 28 November – 3, December, Vancouver BC, Canada. p. 53.

[170] Siciliano, S.; Di Beneditto, A.P. M.; Ramos, R. M. A. 2001. Evidence for Two Isolated Populations of Franciscana *(Pontoporia blainvillei)* off Southeastem Brazil. *In:* Abstracts, *14th Biennial Conference on the Biology of Marine Mammals*, 28 November – 3 December, Vancouver, BC, Canada. p. 196.

specialists on whether the species should be subdivided in *S. fluviatilis* and *S. guianensis*, this latter corresponding to the marine form, which extends into the South Atlantic always inshore and south to Florianópolis, Brazil at 27º 35´ S, where the southernmost resident population of the species is located[171]. Pelagic clupeids, demersal sciaenids and cephalopods account for most of the diet. Abundance estimates of tucuxi only exist for localized, resident populations in several estuaries, bays and embayments along the Brazilian coast in which groups range from some dozens to several hundreds, indicating that its total numbers for the marine form are probably not beyond a few thousands. Therefore, though the species is widespread along eastern South America, it is highly vulnerable, especially due to its inshore habits and constant exposure to habitat degradation, contaminants and anthropogenic disturbances such as bycatch in artisanal fisheries.

Commerson´s Dolphin, *Cephalorhynchus commersonii*

The Commerson's dolphin is distributed south of 41ºS in the coastal waters of southern South America, though stranding records have been made in Southern Brazil. It is also found in the waters off Malvinas (Falkland) and the Kerguelen islands[172,173,174]. The species apparently favors inshore waters and feeds on a wide variety of shrimp, fish and squid. No overall population estimates exist. In Argentine waters, there have been many reports of incidental capture of Commerson's dolphins in gillnets, trammel nets and mid-water trawls[175,176,177,178]. In Santa Cruz Province, Argentina, Provincial Law 2,582 declared the Commerson's dolphin to be a Provincial Natural Monument in July 2001 to protect the local resident populations.

Heaviside´s Dolphin, *Cephalorhynchus heavisidii*

Heaviside's dolphins occur only in the west coast of southern Africa, between Table Bay in South Africa and Northem Namibia, with nearshore coastal distribution. Very little is known about their ecological context and anthropogenic impacts that may threaten their survival in the region, eg fisheries by-catch and contamination from land-based mining[179]. Though it is currently considered common, and possibly the most common dolphin species seen in

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[171] Flores, P.A.C. 2002. Tucuxi - *Sotalia fluviatilis* . *In*: Perrin, W.F., Würsig, B. and Thewissen, J.G.M., eds. *Encyclopedia of Marine Mammals*. Academic Press, San Diego, 1267 – 1269.

[172] Goodall, R.N.P., Galeazzi, A.R., Leatherwood, S., Miller, K.W., Cameron, I.S., Kastelein, R.K. and Sobral, A.P. 1988. Studies of Commerson´s dolphins, *Cephalorhynchus commersonii*, off Tierra del Fuego, 1976-1984, with a review of information on the species in the South Atlantic. *Rep. It. Whal. Comm.* (Special Issue 9):3-70.

[173] Leatherwood, S., Kastelein, R.A. and Miller, K.W. 1988. Observations of Commerson´s dolphin and other cetaceans in Southern Chile, January – February 1984. *Reports of the International Whaling Commission* (special issue 9):71-83.

[174] Iñíguez, M.A. 1991. Tonina overa, *Cephalorhynchus commersonii* (Lacépede, 1804). Pages: 78-82 *in* Capozzo, H.L. and Junín, M. (Eds.) *Estado de conservación de los mamíferos marinos marinos del Atlántico Sudoccidental*. Informes y estudios del Programa de Mares Regionales del PNUMA (UNEP) 138.

[175] Goodall, R.N.P., Galeazzi, A.R. and Lichter, A.A. 1988b. Exploitation of small cetaceans off Argentina 1979-1986. *Rep. Int. Whal. Comm.* 38:407-10.

[176] Goodall, R.N.P., Iñíguez, M.A. and Sutton, P. 1994. Capture of small cetaceans in gillnets off the province of Santa Cruz, Argentina. *Rep. Intl. Whal. Comm.*(Special Issue 15), 617.

[177] Crespo, E.A., Corcuera, J.F. and López Cazorla, A. 1994. Interactions between Marine Mammals and Fisheries in some coastal fishing areas of Argentina. *Rep. Int. Whal. Comm.* (Special Issue 15):269-281.

[178] Iñíguez, M.A., Hevia M., Gasparrou C., Tomsin A.L. and Secchi E.R. 2003. Preliminary estimate of incidental mortality of Commerson's dolphins (*Cephalorhynchus commersonii*) in an artisanal setnet fishery in La Angelina beach and Ría Gallegos, Santa Cruz, Argentina. *LAJAM* 2(2):87-94, July/December 2003.

[179] Elwen, Simon ; Best, Peter. A Comparison of Near Shore Diurnal Movements and Behaviour of Heaviside's Dolphins *(Cephalorhynchus heavisidii)* and Dusky Dolphins *(Lagenorhynchus obliquidens)* on the West Coast of South Africa. *In:* Abstracts, *15th Biennial Conference on the Biology of Marine Mammalse*, 14-19 December, Greensboro, North Carolina, USA. p. 47.

Namibia[180], no reliable population estimates exist and its restricted distribution alone makes the species vulnerable[181].

Rough-toothed Dolphin, *Steno bredanensis*

The rough-toothed dolphin is commonly thought to be a tropical to subtropical species which inhabits deep oceanic waters, rarely ranging north of 40ºN or south of 35ºS and away from continental coasts. However, in Brazil, it has also been regularly observed close to shore, both in the northeast[182] and in the southeastern[183] coasts. It has also been observed at the Abrolhos Bank, off Bahia, and along the coastal archipelago of Arvoredo Biological Reserve in Santa Catarina State. Its diet is composed of a wide variety of fish and squid. Rough-toothed dolphins are rather difficult to study at sea due to schools staying submerged often for long periods of time (sometimes up to 15 minutes)[184]. Groups observed usually vary from 10 to 50 animals[185]. Global population is unknown but probably in the hundreds of thousands.

Hump-backed Dolphin, *Sousa teuszii*

Taxonomy of the genus *Sousa* remains under controversy, and the hump-backed dolphins can belong to anything from three to a single species. Atlantic Humpback dolphin or *S. teuszii strictu senso* known distribution limits are, in the north, Dahkla Bay (23^{o} 50'N), Western Sahara, and in the south, Tombua (15^{o} 47'S), southern Angola, while *S. plumbea*, the Indian Ocean species, occurs from the Cape Province of South Africa east along the African coast towards Arabia and the Indian sub-continent. Its habitat is predominantly inshore coastal and estuarine, over soft-sediment bottoms[186], in areas less than 20m deep and in the surf zone on more open coasts. There are no reports of its presence in offshore waters. The preferred habitat is near sandbanks and mangrove areas, in turbid waters with temperatures ranging between 17°C and 28°C[187]. The main threats for this species may be the mortality by fisheries activities and habitat encroachment, even though further studies are need. There are no global population estimates but the South Atlantic *Sousa* probably number in the few thousands.

Bottlenose Dolphins, *Tursiops spp.*

At least two species of bottlenose dolphins inhabit the South Atlantic Ocean: the Indo-Pacific Bottlenose Dolphin, *Tusiops aduncus*, and the Common Bottlenose Dolphin, *T. truncatus*.

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[180] Best, P.B. and Abernethy, R.B. 1994. Heavviside's dolphin - Cephalorhynchus heavisdii (Gray, 1828). *In*: Ridgway, S.H. and Harrison, S.R., eds: *Handbook of Marine Mammals Vol. 5: The first book of dolphins*. Academic Pres, London, pp. 289-310.

[181] Peddemors V. 1999. Delphinids of southern Africa: a review of their distribution, status and life history. *Journal of Cetacean Research and Management* 1, 157-165.

[182] Aroucha, E. de C., Saar, E., Pereira, A. R., and Queiroz, E. L. *Steno bredanensis* (Lesson 1828), no canal de Itaparica, e *Stenella* sp na Baía de Todos os Santos, (12 55' S e 38 35'W) um movimento errático para as espécies ou reflexo de mudanças na qualidade da água? 1998. 8ª Reunião de Trabalho de Especialistas em Mamíferos Aquáticos da América do Sul. October, 1998.Recife, Brazil. Resumos, p. 13.

[183] Lodi, L. and Hetzel, B. O golfinho-de-dentes-rugosos (*Steno bredanensis*) no Brasil. 1998. 8ª Reunião de Trabalho de Especialistas em Mamíferos Aquáticos da América do Sul. October, 1998.Recife, Brazil. Resumos, p. 112.

[184] Miyazaki N. and Perrin, W.F. 1994. Rough-toothed dolphin Steno bredanensis (Lesson, 1828) *In*: Ridgway, S.H. and Harrison, S.R. eds. *Handbook of Marine Mammals, Vol. 5: The first book of dolphins.* Academic Pres, London, pp. 1-22.

[185] Reeves, R.R. et al, *op. cit.*

[186] Van Waerebeek K., Barnett L., Camara A., Cham A., Diallo M, Djiba A., Jallow A.O., Ndiaye E., Samba Ould Bilal A.O. and Bamy I.L. (2004). Distribution, status and biology of the Atlantic Humpback Dolphin, *Sousa teuszii* (Kukenthal, 1892). *Aquatic Mammals* 30(1): 56-83.

[187] Ross, G.J.B., Heinsohn, G,E, and Cockroft, V.G. 1994. Humpback dolphins Sousa chinensis (Osbeck, 1765), Sousa plumbea (G. Cuvier, 1829) and Sousa teuszii (Kükenthal, 1892). *In*: Ridgway, S.H. and Harrison, S.R. eds. *Handbook of Marine Mammals, Vol. 5: The first book of dolphins.* Academic Pres, London,, pp. 23 - 42.

The first is commonly found in coastal areas around South Africa, while the second is practically cosmopolitan. Recent evidence suggests that a third species, *T. gephyreus*, probably exists in coastal areas of the Southwestern Atlantic[188]. The species tend to explore a wide variety of habitats from inshore to pelagic, and offshore sightings in the Western South Atlantic are common. Its diet varies with local availability of prey species; in Southern Brazil, resident groups of bottlenose dolphins cooperate with artisanal fishermen in capturing mullet in river and lagoon mouths. Coastal home ranges may comprise extensive areas and long-range movements have been recorded for individuals eg in Argentina[189].There are no global population estimates for bottlenose dolphins, but the combined result of some surveys indicate it may be in the hundreds of thousands.

Pantropical Spotted Dolphin, *Stenella attenuata*

The pantropical spotted dolphin is both one of the most abundant dolphin species and one of the most impacted by fisheries by-catch and direct takes, particularly in the North Pacific. The species is found in tropical and subtropical offshore waters between approximately 40^{o}N and 40^{o}S, sometimes in aggregations of hundreds of individuals. Prey items include a wide variety of fish, cephalopods and crustaceans. In the Western South Atlantic it is found mainly in northeastern Brazil beyond the continental slope in depths ranging from 850 to 4900 m. Few strandings were recorded as yet there, probably as a consequence of the species' offshore distribution[190]. The global population of pantropical spotted dolphins is probably in excess of 3 million animals[191].

Clymene Dolphin, *Stenella clymene*

The Clymene dolphin occurs in the South and North Atlantic ocean basins, in tropical and subtropical waters, and appears to be one of the rarest oceanic dolphins. In the Western South Atalntic it is distributed from southern to northeastern Brazil, but it is more frequently observed in offshore waters of the northeastern coast between the 1000m and 4500m isobaths. Strandings of this species are common in northeastern Brazil, with many along the State of Bahia, but sporadic in the southern and southeastern regions[192]. One of the least known species of its genus, the Clymene dolphin feeds on small mesopelagic squid and fish. No global population estimates exist.

Striped Dolphin, *Stenella coeruleoalba*

A cosmopolitan species, the striped dolphin occurs in tropical and subtropical seas. In the Western South Atlantic the Striped Dolphin is mostly found from 7 to 42 degrees South, and sightings closer to the continental margin are more frequent from October to February[193], and it is considered to be one of the least known species off Brazil. Prey species include a wide

[188] Barreto, A. S. 2004. *Tursiops* in Atlantic South America: Is *Tursiops gephyreus* a valid species? Symposium on Cetacean Systematics, 28-29 April 2004, La Jolla, California. Abstracts, p.12.
[189] Wells, R.S. and Scott, M.D. 1999. Bottlenose dolphin - Tursiops truncatus (Montagu, 1821) *In*: Ridgway, S.H. and Harrison, S.R. (eds) *Handbook of Marine Mammals Vol. 6: The second book of dolphins and porpoises.* pp. 137 - 182
[190] Moreno, I.B.; Zerbini, A.N.; Lailson-Brito, J. Jr.; Azevedo, A.F.; Danilewicz, D.I; da Rocha, J.M.; Siciliano, S.; Simões-Lopes, P,C.; Maia-Nogueira, R. 2001. Distribution of Dolphins of the Genus *Stenella* in Brazilian Waters. *In:* Abstracts, *14th Biennial Conference on the Biology of Marine Mammals*, 28 November – 3 December, Vancouver, BC, Canada. p. 148.
[191] Reeves, R.R. et al, *op.cit.*
[192] Moreno, I.B. et al, *op. cit.*
[193] Bastida,R.; Rodríguez, D.; Desojo, J.; Rivero, L. 2001. Striped Dolphin Occurrence in the South Westem Atlantic Ocean. *In:* Abstracts, *14th Biennial Conference on the Biology of Marine Mammals*, 28 November – 3, December, Vancouver, BC, Canada. p. 18.

range of shoaling fish and cephalopods[194]. The species appears to be relatively rare in parts of the South Atlantic, and there are no global population estimates.

Atlantic Spotted Dolphin, *Stenella frontalis*

The Atlantic spotted dolphin occurs in the North and South Atlantic from temperate to tropical waters. Its distribution along the African coast in the South Atlantic is poorly studied, but along South America it is distributed from southern to northeastern Brazil, where the species exhibits the highest preference for nearshore habitats within its genus, being generally found west of the 1000m isobath[195]. Small fish, cephalopods and benthic invertebrates are its main food items[196].There are no reliable population estimates for the species.

Spinner Dolphin, *Stenella longirostris*

The spinner dolphin is found in tropical and subtropical pelagic waters and around oceanic islands. In the Western South Atlantic, from southern to northeastern Brazil, It inhabits waters over the shelf and slope, in depths ranging from 170 to 2700m.[197]. It forages for small mesopelagic fish, squid and shrimp usually in waters between 200 to 300m deep. Though it is a widespread species numbering probably in the few millions, local populations around oceanic islands are very vulnerable to anthropogenic impacts. At the archipelago of Fernando de Noronha, groups of a resident population (which may reach about two thousand individuals) is observed on an almost daily basis at a specific bay, now protected inside a National Marine Park, allowing for the development of long-term studies.

Fraser´s Dolphin, *Lagenodelphis hosei*

Fraser's dolphin is a typically high-seas dolphin of tropical waters, occurring usually beyond the 1000m isobath, and strandings in temperate areas are considered to represent extralimital occurrences related to temporary oceanographic anomalies, such as the *El Niño* phenomenon[198]. In the Southwestern Atlantic the species was first recorded in Uruguay, where several strandings have been recorded in recent years., as well as in the southern and southeastern Brazilian coast. It feeds basically on mesopelagic fish. No population estimates exist for the species.

Long-beaked Common Dolphin, *Delphinus capensis*

The species occurs in a disjunct distribution pattern in several nearshore areas in tropical and subtropical waters. The overall distribution remains imperfectly known because of past confusion with *D. delphis*, but specimens from the South Atlantic have been identified from the following regions: coast of eastern South America from Venezuela in the North Atlantic to northern Argentina; west Africa from Western Sahara to Gabon; and the coast of South Africa from western Cape Province east to Natal. The species is relatively common off Cape Frio, in Southeastern Brazil. Small schooling fish and squid are its main food items, and these

[194] Reeves, R.R. at al, *op. cit.*
[195] Moreno, I.B. et al, *op. cit.*
[196] Reeves, R.R. et al, *op.cit.*
[197] Moreno, I.B. et al, *op. cit.*
[198] Perrin, W.F.; Leatherwood, S. and Collet, A. 1994. Fraser's dolphin *Lagenodelphis hosei* Fraser, 1956. In: Ridgway, S.H and R. Harrison (eds). Handbook of Marine Mammals, vol. 5. Academic Press, London, Chap 10: 225-240.

latter seem to be the preferred prey off Brazil[199]. No global population estimates exist.

Short-beaked Common Dolphin, *Delphinus delphis*

D. delphis, like the previous species, is distributed discontinuously in tropical and subtropical waters both above continental shelves and in pelagic environments. In the eastern South Atlantic it is recorded in Gabon, and recent records indicate that, contrary to earlier assumptions, the species most likely also occurs off Brazil[200]. Its dietary habits are similar to the long-beaked species, and it has been proposed that its foraging is attuned to the nighttime vertical migration of the deep scattering layer[201]. There are no global population estimates for the species.

Peale´s Dolphin, *Lagenorhynchus australis*

Peale´s dolphins are found mainly in the coastal waters of southern South America[202], normally from 44°S in the Atlantic to 38°S in the southeastern Pacific and exceptionally to 33°S in the southeastern Pacific to 38°in the southwestern Atlantic. The species is confined to near-shore waters and it seems to be closely associated with kelp beds. The dolphins in Beagle Channel, the Magallanes and southern Tierra del Fuego have been harpooned for crab bait since the 1970's which cause reduced abundance by the late 1980's. Nevertheless recent evidence suggests that the scale of exploitation has declined and that some recovery may be occurring[203,204].

Hourglass Dolphin, *Lagenorhynchus cruciger*

The hourglass dolphin is a cold-water species occurring around Antarctica and in temperate offshore waters at least to 36^{o} S in the South Atlantic[205]. It apparently prefers offshore areas. Its main prey species are myctophiid fish, squid and crustaceans. Population estimates in the Antarctic indicated the existence of at least 140,000 animals[206].

Dusky Dolphin, *Lagenorhynchus obscurus*

The dusky dolphin is distributed in cool temperate waters of the Southern Hemisphere. Its occurrence is well documented *inter alia* along the coasts of Southwest Africa and Argentina, associated respectively with the Benguela and Malvinas (Falklands) currents in areas over the continental shelf and slope[207]. The species has been also recorded from the vicinity of many oceanic island groups in the

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South Atlantic and elsewhere. Off the waters of Angola and Namibia, the species has been observed in September in deep waters, feeding on Cape horse mackerel *Trachurus trachurus capensis* at depths down to approximately 170 m[208]. Off South America, southern anchovy *Engraulis anchoita* and several cephalopods compose the species´ diet. Dusky dolphins are caught accidentally in fisheries off Namibia, and their current population is unknown.

Southern Right Whale Dolphin, *Lissodelphis peronii*

Southern right whale dolphins are found mainly in Subantarctic waters, but in the South Atlantic there are records as far as São Paulo State in Brazil at about 25° S, with most records from winter months, and Walvis Bay in Namibia at about 23° S; they most likely follow the colder waters of the Malvinas (Falklands) and Benguela currents[209]. In Namibian waters the species is probably resident[210]. Large schools of these dolphins have been recorded, with hundreds of individuals. A variety of fish and squid comprise its diet, with lanternfish being a common food item[211]. The species is poorly studied and there are no population estimates.

Risso´s Dolphin, *Grampus griseus*

This large delphinid is widely distributed in oceanic and continental shelf margins from tropical to temperate waters worldwide, usually found in waters 400-1000m deep[212], where it preys on a mix of neritic, oceanic, and occasionally bottom dwelling cephalopods[213]. In Argentina, there have been several coastal sightings, particularly in Patagonia, interacting with dusky dolphin groups[214]. No population estimates exist for the species.

Melon-headed Whale, *Peponocephala electra*

The melon-headed whale is a pantropical species which reaches into the South Atlantic from the Equator to Southeastern Brazil and South Africa´s Cape Province. They are markedly oceanic but may reach coastal areas following upwellings, and are usually found in large pods[215]. A variety of fish and small squid comprise their diet. There are no reliable population estimates for the species.

Pygmy Killer Whale, *Feresa attenuata*

Pygmy killer whales have been recorded in all major oceans in tropical, subtropical and

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temperate waters[216]. Very few records exist in the Western South Atlantic, with stranded animals recorded for Argentina and Southeastern Brazil[217]. Fish and squid comprise most of their diet, though there have been records of attacks on smaller cetaceans. Very little else is known about this species, and its population size has not been estimated.

False Killer Whale, *Pseudorca crassidens*

The false killer whale occurs in all tropical, subtropical and warm temperate seas, and its distribution is largely determined from stranding records. The species habitat is considered to be primarily oceanic[218]. Occurrence has been confirmed in the Western South Atlantic from Tierra del Fuego and other regions of Argentina, Northeastern to Southern Brazil, including mass strandings[219]. The species is also known from Southern Africa where large mass strandings have been recorded[220]. Epipelagic and oceanic squid species including *Ommastrephes bartramii* apparently are an important food item for false killer whales in the Western South Atlantic, confirming their oceanic distribution.

Orca, *Orcinus orca*

Orca is a cosmopolitan species with a very wide distribution and occurring along most of the South Atlantic with widespread coastal and offshore sightings. In Brazil, sightings off the Southeastern coast appear to have become more frequent in recent years. The species has been studied since 1975 in Northern Patagonia, Argentina. Thirty killer whales have been identified and studied in the region since 1975 and some individuals use a 1,000 km stretch of Northern Patagonian coastline[221].

Prey species for orca include the South American sea lion (*Otaria flavescens*) and Southern elephant seal (*Mirounga leonina*)[222,223] among many other marine mammals, besides large-sized fish and penguins. Resident orcas from Patagonia exhibit a peculiar intentional stranding behavior to capture pinnipeds[224]. Recently, predation on sevengill sharks (*Notorhynchus cepedianus*) in Patagonia, Argentina was recorded[225]. Interaction with fisheries of *Xiphias gladius, Thunnus* spp. and orcas were registered in Uruguay and Brazil as well as sightings along the coast[226,227].

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Short-finned Pilot Whale, *Globicephala macrorhynchus*

Though no comprehensive studies have been conducted on the species, short-finned pilot whales appear to vary on a geographical basis. Present in all tropical and subtropical seas, it occurs in the South Atlantic from the Equator to, in the east, the Cape Province in South Africa, and in the west the vicinities of São Paulo, Brazil[228]. There is a marked preference for deep water areas, and though they can also take fish, short-finned pilot whales are especially well-adapted to eat squid[229], which they hunt down to at least 800m deep. There are no global population estimates for the species.

Long-finned Pilot Whale, *Globicephala melas*

With little range overlap in relation to the former species, *G. melas* occurs in all cold and temperate waters of both hemispheres. In the South Atlantic it can be found north to southeastern Brazil and to Angola, following the colder currents. In Argentina, it is one of the most common cetacean species in strandings records[230] Though it is probably more common offshore, coastal records do exist. It preys mainly on suid, but small and medium-sized gregarious fish is also preyed upon opportunistically. There are no global population estimates, but it has been estimated that some 200,000 long-finned pilot whales may exist around Antarctica[231].

Spectacled Porpoise, *Phocoena dioptrica*

The spectacled porpoise occurs mostly south of the Antarctic Convergence, but os also recorded northwards following the Malvinas (Falklands) current into the subtropical South Atlantic[232]. Strandings records indicate that sexually mature animals can reach Southern Brazil. This species is among the less studied of the small cetaceans and almost nothing is known of its biology, and virtually nothing of its population size or status.

Burmeister´s Porpoise, *Phocoena spinipinnis*

Burmeister´s porpoises are restricted to waters around Southern South America; in the South Atlantic they range from Tierra del Fuego to the State of Santa Catarina, Brazil. Its distribution is most likely restricted to the cooler waters carried by the Humboldt (in the Pacific coast) and Malvinas (Falklands) currents[233]. The species is very difficult to detect in the field due to its inconspicuous behavior and dark color, and very little is known about its biology. It feeds on demersal and pelagic fish, as well as squid and crustaceans. There are no population estimates for the species.

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