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In this chapter we refer to the area of the Atlantic Ocean south of the Equator and north of the Polar Front (Antarctic Convergence). The main topographical feature in the South Atlantic is the Mid-Atlantic Ridge which runs between Africa and South America from approximately 58° South to Iceland in the north. A rift valley is associated with the Ridge. The Ridge is of volcanic origin and the development of transverse ridges creates a number of basins: the Argentine, Brazil, Guinea, Angola and Cape Basins.

The Atlantic coast of South America is influenced by three major rivers, Orinoco, Amazon and La Plata, that discharge large amounts of freshwater and sediment into the Atlantic Ocean. The Amazon discharges about one-fifth of the world's total freshwater runoff into the Atlantic (Curtin, 1986) and it is transported offshore up to 500 km seaward (Lentz, 1995). The heavy sediment discharge ($2.9 \cdot 10^8$ tons year)$^{-1}$) is not deposited over the outer shelf, but is carried by the North Brazil Current to Guyana's shelf, where it forms extensive mud deposits (Gratiot et al., 2008). The continental shelf is wider along its West Coast, both in the north at the Amazon (≈300 km) and in southern Argentina, where it reaches up to 600 kilometres (Miloslavich et al., 2011). The shelf is narrower along the East Coast of the Atlantic and also along the east coast of Brazil, where riverine muds give way to calcareous deposits and the shelf in some areas reaches a minimum of 8 km width (Miloslavich et al., 2011).

The continental slope is cut by deep canyons connecting shelf and deep waters. High benthic richness was reported at the head of the submarine canyons, and about half of the species are shared with the shelf-break community (Bertolino et al., 2007; Schejter et al., 2014b). The ~7500 km of the Brazil coasts comprise a combination of freshwater, estuarine and marine ecosystems, with diverse but poorly known habitats in its northern part and with sandy beaches, mangrove forests, rocky shores, lagoons

South Atlantic waters are characterized by the counterclockwise central subtropical gyre of surface and intermediate waters running close to South America and South Africa, with more complex currents developing on the coasts of both continents (Campos et al., 1995;

targeted by the commercial fishery with substantial annual catches (Arkhipkin et al. 2013). On the African coast, the chokka squid (*Loligo vulgaris reynaudii*) is closely linked to the Agulhas ecosystem; its catches and biomass are highly variable (Roberts, 2005) and, in the south Brazil ecosystem, *Loligo plei* is an important link between pelagic and demersal energy pathways (Gasalla et al. 2010), supporting small-scale fisheries around São Sebastião Island (Postuma and Gasalla, 2010). Other squid species, such as *D*

Vent sites 3° – 7° south of the Equator were found to contain the mussel *Bathymodiolus puteoserpentis*, the vesicomyd clam *Abyssogena southwardae*, and the alvinocarid shrimp *Rimicaris exoculata,* also common in North Atlantic vent sites. These records imply that the Equatorial Fracture Zone may not be a significant barrier to dispersal of North and South Mid-Atlantic ridge fauna (German et al., 2011). Nearly 190 benthic species records were obtained in non-chemosynthetic environments of the Mid-Atlantic Ridge and Walvis Ridge, with particularly increased diversity found on the Romanche Fracture Zone (Perez et al., 2012). Among these records new species of Hemichordates, amphipods and caridean shrimp were recently described (Cardoso and Fransen, 2012; Holland et al., 2013; Serejo, 2014). Findings such as the ones described will tend to escalate as the deep areas of the South Atlantic are more and better sampled in the future.

National efforts to increase the knowledge on marine biodiversity are taking place in recent years. The Long-Term Ecological Studies Programme(PELD, in Portuguese), funded by the Brazilian National Science Foundation (CNPq), and the SISBIOTA Programme(National Biodiversity System), funded by national and state science-funding agencies, are examples of structured initiatives to produce relevant information on benthic habitats. Several groups are producing temporal series of benthic data to enable the understanding of the impacts of local and global changes. The Brazilian Network for Monitoring Benthic Coastal Habitats (ReBentos; rebentos.org) is a strategy to aggregate and support this kind of study, linking the scientific efforts to public policies related to marine conservation, such as the National System of Marine Protected Areas, the National Plans for Adaptation to Climate Changes, and the National Action Plans for

marine area, the Guinea-Benguela Currents convergence zone, and the equatorial production zone. This latter zone stretches along both sides of the Equator to the convergence of the Guinea-Canary Currents; the area was described for its high productivity. It is also a breeding ground and migration area for tuna and related species, as well as of marine mammals. Overall 45 areas of interest were identified as requiring further research in the fields of oceanography, geomorphology, ecology and taxonomy.

The benthic communities are subject to different natural and anthropogenic disturbances, depending on the area. Overfishing, trawling, chemical contamination in harbours and coastal areas, changes in the habitats due to the introduction of alien species, oil prospective and extractive activities are the main activities influencing benthic communitiesrurth<31(f)-4(c)8w

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One promising tool to reconcile benthic conservation and industrial development is offered by the implementation of Marine Protected Areas (MPA) (Marone et al., 2010; Turra et al., 2013). Studies and efforts to increase the number of MPAs are ongoing, such as the survey of priority areas for marine conservation in Brazil (MMA, 2007). In fact, the pressure of particular stakeholders (as shrimp farmers) reduced the protection of mangroves and wetlands along the Brazilian coast (Rovai et al., 2012). In addition, the recent findings of high oil and gas reserves in the Pre-Salt layer off the Southern-Southeastern Brazilian coast, as well as the potential of mining activities, raise awareness about the conservation of the fragile deep-sea benthic habitats.

Due to growing maritime traffic, the record of exotic species is expected to increase. In the Southwest Atlantic, a survey of exotic species in coastal and shelf areas of Uruguay and Argentina revealed that 31 species were introduced and 46 were cryptogenic. Coastal ecosystems between La Plata and Patagonia have been modified. Only exposed sandy beaches appear to be free from the pervasive ecological impact of invasion by exotic species. Poor knowledge of the regional biota makes it difficult to track invasions (Orensanz et al., 2002). Alien species (more than 40 reported for Argentina) severely modified native habitats and may cause loss of biodiversity. The most significant examples are: the Japanese alga *Undaria pinnificata* that highly transformed the benthic structure found in gulfs and bays in Patagonia (Dellatorre et al., 2012), the introduced barnacles that greatly modified hard substrates in harbours and surrounding areas, the polychaete *Ficopomatus enigmaticus* that built reefs in the coastal lagoon Mar Chiquita

4.1 Status

The area of direct influence of the Amazon and Tocantins rivers is highly heterogeneous in terms of the dynamics of sedimentary deposition and freshwater discharge. This determines the characteristics of its fauna (Coelho, 1980; Camargo and Isaac, 2001) and flora (Prost and Rabelo, 1996), including species richness and distribution patterns (Giarrizo and Krumme, 2008). This area supports high fish biodiversity. Camargo and Isaac (2003) estimated that >300 fish species inhabit this area from 23 orders and 86 families, with a high degree of diversification mainly of the families Sciaenidae and Ariidae, but also of Rajiformes, Pleuronectiformes and Tetradontiformes. Many fish species of these families were also reported in French Guyana, Suriname and Guyana (Lowe Mc-Connell, 1962; Planquette et al., 1996, Le Bail et al., 2000, Keith et al., 2000) and Venezuela (Cervigon, 1996). Souza and Fonseca (2008), who also included information on the shelf and shelf break, identified more than 500 species from 106 families. A river-ocean gradient in the distribution of different species reflects their capacity to tolerate varying levels of salinity. Seasonal changes occur in the composition of the fish community, with predominance of freshwater species during the rainy season and marine species during the dry season (Camargo and Isaac, 2001). The high productivity of the area offers a high potential for fishery activities due to the numerous rivers and estuaries that empty into the Atlantic Ocean, forming a complex aquatic environment with high biological productivity.

Further south along the east Brazil LME, fringing and barrier reefs occur along the coast and over the shelf, harbouring diverse reef fish communities (Maida and Ferreira, 1997; Floeter et al., 2001). Offshore are located a major oceanic plateau, the Ceara Rise, and the Fernando de Noronha Ridge, with a chain of seamounts and the only atoll in the South Atlantic Ocean, Atol das Rocas. The Southwestern Atlantic region (SWA; including Brazilian oceanic islands and Argentina) has an impoverished reef fish fauna in relation to the Northwestern Atlantic and Caribbean, with only over half (471) of the reef species richness and 25 per cent of endemic species distinguishing the ‘Brazilian Province’ (Rocha, 2003; Floeter et al., 2007).

The Amazon freshwater and sediment outflow is a strong (albeit pFlotic[(a()8(4)128ao(e)-1(a)10(n)f37Tcin

physical barrier to the Brazil Current, hence upwelling and land conditions create even more diversity, especially for the reef fauna.

The South Brazil Shelf Large Marine Ecosystem (LME) extends roughly over the entire continental shelf off southeastern South America. The shelf waters result from the

Some species in the south west Atlantic have experienced local collapse (e.g., *Cynoscion guatucupa*, a migratory species*)* at Bahía Blanca from the increasing fishing pressure exerted by the industrial fishing fleet operating in open waters (López Cazorla et al., 2014). Information on the status of the exploited species can be found in www.inidep.edu.ar/pesquerias/ppales-pesquerias.

Global climate change affects fish and fisheries. The effects range from increased oxygen consumption rates in fishes, to changes in foraging and migrational patterns in polar seas, to fish-community changes in bleached tropical coral reefs. Projections of future conditions portend further impacts on the distribution and abundance of fishes associated with relatively small temperature changes (Roessig et al., 2004). The information on the effects of climate change and long-term studies to assess those effects in the Southwest Atlantic are scarce or non-existent. Schroeder and Castello (2010) modelled effects of climate change scenarios on Patos Lagoon estuarine-dependent resources, notably pink shrimp, white-mouth croaker and grey mullet. ENSO cycles and climate changes may increase the limnic and decrease the saline influence in the estuary. This scenario may affect the biology and dynamics of estuarine-dependent species and their fisheries, because temperature influences metabolism, which affects

Worldwide, 129 species of marine mammals are described, of which 60 have also been reported for the South Atlantic Ocean (Perrin et al., 2009). Among resident, frequent and occasional visitors, the South Atlantic Ocean is home to approximately 20 species of the Order Carnivora (Suborder Pinnipeda and Family Mustelidae), and ~45 species of the Order Cetacea. Three Mysticete families (seven species of baleen whales), five Odontocete families (27 species of toothed whales), two Pinniped families (10 species), two Mustelidae species and one Sirenid family (a manatee) were reported for Patagonian and Brazilian coastal waters. Throughout South America, we find marine mammals that are endemic or limited in distribution (La Plata River dolphin, Austral dolphin, Commerson dolphin and manatees), and others with wider distribution that depend on coastal areas of the region for important stages of their life cycles.

Some baleen whales, such as the southern right whale and the humpback whale, breed in waters off Santa Catarina, Brazil (28°S), the north Patagonian gulfs (34°S), or in the Abrolhos Bank (17°S), Northeast Brazil, and on the coast of Southwest Africa. The only representative of the manatees in the SAO, *Trichechus manatus,* occurs discontinuously along coastal waters of Northeast Brazil (Alagoas -9°S to Amapá 0°) where it is under serious threat (Luna et al., 2010). Manatees (*Trichechus* spp.), that are commonly found in mangrove areas in the North and Northeast regions and along the Amazon River Basin, were hunted in the past for their meat and skin and were at risk of extinction, but they are currently protected by the Brazilian Government. Humpback whales (*Megaptera novaengliae)* frequent the southern tip of South America, the Beagle Channel and South Africa. Blue whales (*Balaenoptera musculus)* are only seen sporadically along northern Argentine and South African coasts. Southern right whales, *Eubalaena asutralis,* inhabit the north Patagonian gulfs, one of the most important breeding grounds for the species, and are also regularly seen along the coasts of Uruguay and Brazil. Three coastal dolphins are endemic to the region: Peale's dolphin *Lagenorhynchus australis*, Commerson's dolphin *Cephalorhynchus commersonii* and the La Plata or Franciscana

Among the cetaceans that visit and live within the Southwest Atlantic Ocean, five species are considered "vulnerable" or "endangered" worldwide. Among these are the blue whale, the humpback whale, the sperm whale *Physeter macrocephalus*, the La Plata River dolphin *Pontoporia blainvillei* and the manatee *Trichechus manatus.* Most of the Odontoceti species are considered to be data-deficient (Lewis and Campagna, 2008). Two of the three mustelid species, *Lontra provocax* and *L. felina*, that inhabit the southern region, are considered endangered.

5.2 Pressures

Some coastal species are threatened by anthropogenic activities, such as pollution, fishing and fisheries by-catch, tourism activities, coastal development and habitat destruction. Pelagic species are also threatened by increasing traffic of ocean vessels (boats and ships), seismic prospection, fishing, and oil and gas activities.

The indirect effects of fisheries have also been observed in seal populations. For the South American sea lion it has been shown that the level of harvested squid and hake could have a negative impact on seal populations (Koen Alonso and Yodzis, 2005). In the Benguela ecosystem, the interaction of seals (Cape fur seal *Arctocephalus pusillus pusillus)* and fisheries have been also described (Yodzis, 1998).

Artisanal fisheries and entanglement pose a major threat for small cetacean populations, in particular the endangered La Plata dolphin (Praderi et al., 1989; Pérez Macri and Crespo, 1989; Secchi et al., 1997). Although not in big numbers and without a clear impact on the population, some other species caught in fishing nets are the Commerson's dolphin (Crespo et al., 1994; Crespo et al., 1997; Crespo et al., 2000; Schiavini and Raya Rey, 2001; Dans et al., 2003), dusky dolphin, common dolphin and seals (Dans et al., 1997; Crespo et al., 2000; Dans et al., 2003). Elephant seals are also known to become entangled in squid fishing gear (Campagna et al., 2007), as well as many sea lions dying every year with plastic rings around their necks, although this fact has not been quantified and therefore its effect on the population is not known.

5.3 Trends

magellanicus, southern rockhopper penguin *Eudyptes chrysocome* and black-browed albatross *Thalassarche melanophris*) have over half their world population in the area (Boersma et al., 2013; Pütz et al., 2013) and two others (gentoo penguin *Pygoscelis papua* and thin-billed prion *Pachyptila belcheri*) probably have more than one-quarter of their world population in the region (Croxall and Wood, 2002).

Seabird diversity and abundance have long been studied by ship surveys (e.g., Cooke and Mills, 1972; Jehl, 1974; Veit, 1995; Orgeira, 2001a; Orgeira, 2001b). With advances in technology (satellite tracks, global positioning system devices and geolocators), the origin, sex, age and status of birds using the area can be established and quantified (Falabella et al., 2009). Therefore, it is known that the area is intensively used by a wide range of species: from pelagic flying birds (e.g., Jouventin and Weimerskirch, 1990; Weimerskirch et al., 1997; Prince et al., 1998; Berrow et al., 2000; González-Solís et al., 2002; Quintana and Dell'Arciprete, 2002; Trathan and Croxall, 2004; Masello et al., 2010) to penguins (Stokes et al., 1998; Stokes and Boersma; 1999; Pütz et al., 2002; Pütz et al., 2007; Wilson et al., 2007; Raya Rey et al., 2007; Sala et al., 2014; Rattcliffe et al., 2014) and coastal birds (Suárez and Yorio, 2005; Suárez et al., 2012). The waters are not only used by resident species but also by seabirds that breed in distant colonies: wandering albatrosses *0.4IeTw 0(t a)4(l)4(s)6(o)2( )-418l3(e),*

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Spheniscidae, Hydrobatidae, Pelecanidae, Sulidae and Haemotopodidae with one species each, three species of the Laridae family and four species in the Phalacrocoracidae and Sternidae families (Kemper et al., 2007). Seabirds from the Benguela Ecosystem are highly threatened; in particular, the African Penguin *Spheniscus demersus* and Cape Cormorant *Phalacrocorax capensis* are now considered endangered following ongoing decreases (Birdlife, 2014).The Southeast Atlantic Ocean also has numerous islands (Ascension, St. Helena, Inaccessible, Tristan and Nightingale) rich in seabird species (Cuthbert 2004; Birdlife, 2014). Most of these islands are home to the endangered northern rockhopper penguin *Eudyptes moseleyi* (Birdlife, 2014), and 15 albatrosses and petrels foraging within these waters qualify under the IUCN criteria for globally threatened status, such as the Tristan albatross which is critically endangered (Abrams, 1983; Abrams, 1985; Ryan and Moloney, 1988; Nel and Taylor, 2002; Wanless et al., 2009; Petersen et al., 2009; Birdlife, 2014).

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6.2 Trends

Population trends of resident and non-resident seabirds that forage in the Southwest Atlantic Ocean present different trajectories over the years, with some species showing opposite trends at different locations. Some of the large Procellariiformes species have declined over the past decades (i.e., wandering albatross) and this trend continues (Poncet et al., 2006), but others, such as the southern giant petrel, are recovering at least at some colonies (Reid and Huin, 2005; Quintana et al., 2006; Wolfaardt, 2012). Small petrels' trends are not well known in the area (Otley et al.,

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are the least studied of the species, with small populations and frequent variations in colony locations with unknown trends (Yorio, 2005; Otley et al., 2008).

Southeast Atlantic seabird population trends contrast between species, but several have experienced severe decreases during the last decades, such as the African penguin, the Cape Gannet *Morus capensis* and Cape cormorant (Kemper et al., 2007). Some gull populations are increasing, which is largely attributable to the provision of additional food sources from human activities (Crawford, 1997) and the cessation of population control measures (mainly the destruction of eggs and chicks) at most breeding localities (Hockey et al., 2005). The decrease in Northern rockhopper penguins is evident from population estimates in the Tristan da Cunha group and Gough Island, which indicate a decline of more than 50 per cent (Cuthbert et al., 2009). The Tristan albatross also decreased severely at 3 per cent per year, and the sooty albatross *Phoebetria fusca*, Atlantic yellow-nosed albatross *Thalassarche chlororhynchos* and southern giant petrels *Macronectes giganteus* remained stable during the last decade (Cuthbert et al., 2014).

6.3 Pressures

Direct and indirect discharge of chemical pollutants, industrial and expanded city pollution, bycatch, entanglement, climate change and alien species pose severe threats for seabird populations both at sea and at their colonies in the Southwest Atlantic Ocean. Oil pollution in Argentine inshore waters is of major concern and kills thousands

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