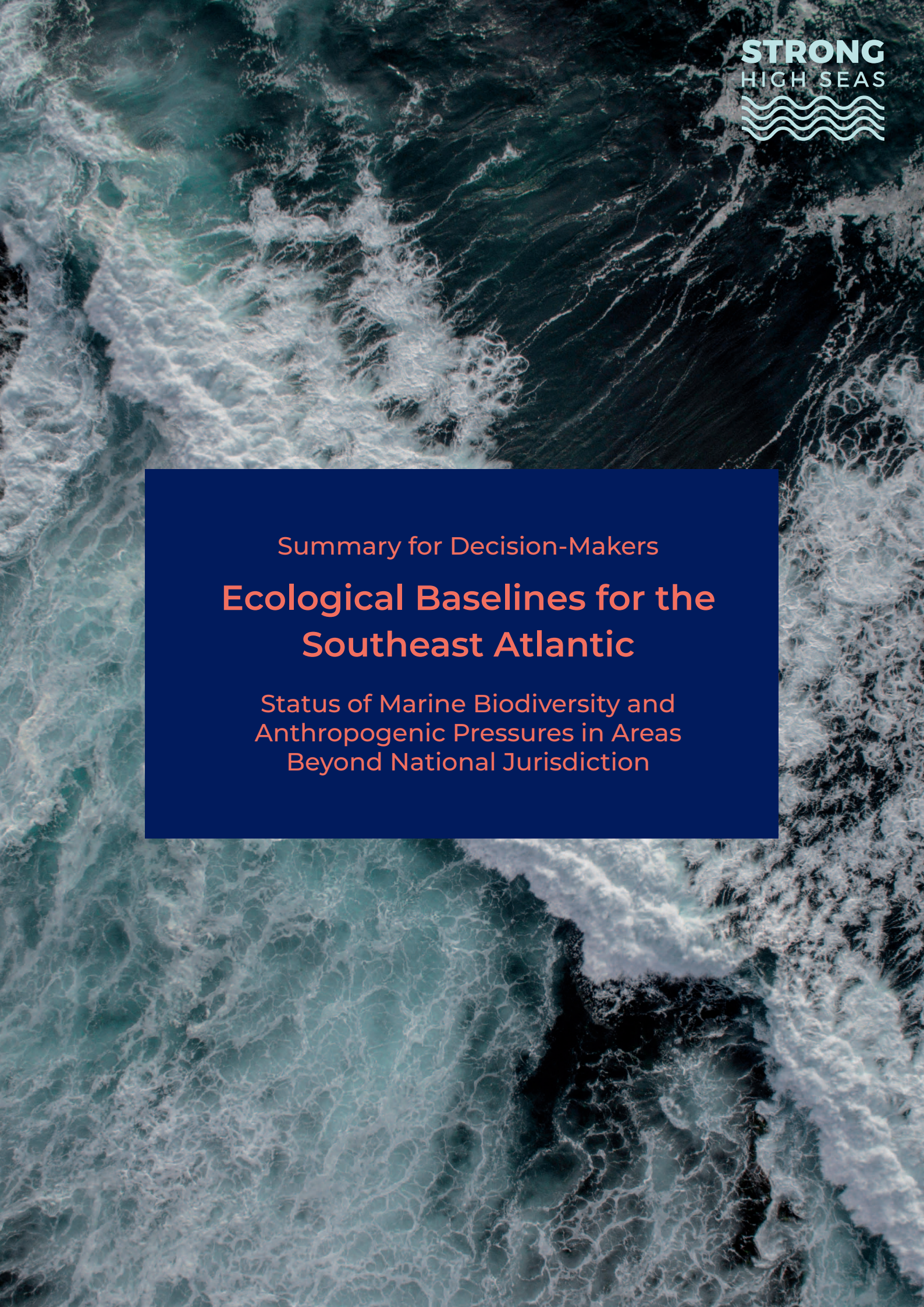

STRONG HIGH SEAS

Summary for Decision-Makers

Ecological Baselines for the Southeast Atlantic

Status of Marine Biodiversity and Anthropogenic Pressures in Areas Beyond National Jurisdiction

Citation

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1) Areas Beyond National Jurisdiction are Vital to All Life on the Planet

This summary for decision makers is based on the report 'Ecological Baselines of the Southeast Atlantic and Southeast Pacific – Status of Marine Biodiversity and Anthropogenic Pressures in Areas Beyond National Jurisdiction' and provides consolidated information on key biological and ecological features of Areas Beyond National Jurisdiction (ABNJ) in the Southeast Atlantic as well as highlights key pressures placed upon it by human activities.[1] ABNJ include the water column (the high seas) and the seabed (the Area) outside of the Exclusive Economic Zone (EEZ) of coastal States and cover about half of the Earth's surface. This summary is intended to inform relevant actors and stakeholders to support their understanding of the function and importance of marine biological diversity in ABNJ and the need to for appropriate conservation and management measures. The report was prepared as part of the Strengthening Regional Ocean Governance for the High Seas ('STRONG High Seas') project – funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) through the International Climate Initiative (IKI).

The ocean covers more than 70 % of the planet and is a vital support system for all life; **ocean health is strongly interconnected with human well-being**. It regulates the global climate and provides essential resources and ecosystem services, hosting immense biological diversity and a diverse array of economic activities. ABNJ of the Southeast Atlantic region are characterised by high biological productivity, supported by important oceanic currents.

Pressure on marine biological diversity in ABNJ is caused by increasing and intensifying human activities, such as fishing and shipping, oil and gas extraction, port development, urban expansion, tourism and other land-based activities. Emerging activities, such as deep-sea mining, will potentially further threaten ocean health if it comes to fruition. **Climate change intensifies the pressure on marine ecosystems**, as it leads to rising ocean acidity, declining oxygen levels, warming waters and shifting ocean currents.

It is important to realise that **ABNJ and national waters (or Exclusive Economic Zones) are biologically and ecologically connected through migratory and circulatory connectivity.** This ecological connectivity is essential to healthy marine ecosystems across the globe. For example, regions such as upwelling sites or seamounts have an especially high biological productivity and are important to restock marine resources in other marine areas. Ecological connectivity also means that **disturbances to marine biological diversity are not contained but have effects far beyond the immediate area of impact**. For example, the negative effects of overfishing or habitat degradation in ABNJ will also impact fisheries in coastal zones, and vice versa. The downstream effects of activities in ABNJ are especially critical for a range of developing countries, where large parts of the population rely on marine resources not only for revenue, but also for food security. Ecological connectivity between ABNJ and EEZs must be recognised in governance approaches and **there is an urgent demand to rethink how to effectively conserve and sustainably manage the ocean as a whole**.

The importance of establishing a robust scientific knowledge base to develop informed and sound governance approaches cannot be underestimated. Many gaps in knowledge exist and should be filled to support the development of a comprehensive and appropriately representative suite of sites for marine biological diversity conservation in ABNJ. Nevertheless, there is sufficient evidence to show that **marine ecosystems in ABNJ are being fundamentally**

[1] A companion summary focusing on the Southeast Pacific is available here: https://www.prog-ocean.org/our-work/strong-high-seas/strong-high-seas-resources/

and irreversibly changed. However, it is difficult to predict the details of those changes and how the expected alterations to ecosystems and species will affect the future of humanity. The establishment of **a scientific knowledge base will also be important to build capacity and provide the necessary impetus for the transfer of marine technology** and therefore requires coordination and collaboration between scientific institutions at the national, regional and global levels. Gaps in knowledge only underscore the need for the application of the precautionary principle in ocean management. The Stockholm Declaration (1972) and the Rio Declaration (1992), as well as the Convention on Biodiversity (1993) support the application of the 'precautionary principle'.

There is no justification for delaying coordinated and cross-sectoral policy action. There is only one ocean and it needs to be protected and managed as a whole to respond to the cumulative pressures stemming from human activities, both on land and at sea. **Ecological connectivity demands transboundary, multi-level and cross-sectoral governance approaches for the conservation and sustainable use of marine biological diversity**, including in ABNJ, based on ecologically defined management units rather than jurisdictional boundaries. This means that States must not only cooperate with their neighbouring States but extend their actions across the EEZ-ABNJ jurisdictional divide. There is also urgency to further strengthen and apply multilateral instruments, e.g. Regional Fisheries Management Organisations (RFMOs) and ensure that responsible and sustainable practices in ABNJ are enforced. There is a pressing need for all States to insist that their rights and futures are not compromised by the actions of others, but to do so, they must become actively engaged in driving sustainable, responsible practices in ABNJ, at all relevant fora.

Through Resolution 72/249 of December 2017, the United Nations General Assembly (UNGA) decided to convene an Intergovernmental Conference (IGC) to begin negotiations on the development of a new internationally legally binding instrument under the UN Convention on the Law of the Sea (UNCLOS) for the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (BBNJ). **The negotiation of a new international legally binding instrument for BBNJ is a historic opportunity to promote an integrated, coherent and consistent approach to governance of ABNJ and support improved cross-sectoral cooperation**, also at the regional level. States could seek to champion the adoption of a strong agreement that can enhance regional and global efforts, including: overarching governance and environmental principles to guide decision-making; global biological diversity conservation objectives, targets and obligations; rules and standards for practices and procedures to ensure that the impacts of human activities are assessed effectively and transparently; rigorous requirements for ecosystem-based management, protection of marine biological diversity, and transparency; and for the establishment or strengthening of regional and global integration mechanisms.

2) Marine Biological Diversity and Pressures in Areas Beyond National Jurisdiction – The Southeast Atlantic

ABNJ, including in the Southeast Atlantic, are highly important and productive regions sustaining marine biological diversity as well as providing habitats and feeding grounds for numerous marine species thus underpinning the functioning of the marine food web and biogeochemical cycles.

Areas of special biological or ecological importance

There exist numerous established spatial tools which are focussed on highlighting biological diversity and indicating areas of special biological or ecological importance, including Ecologically or Biologically Significant Marine Areas (EBSAs), Key Biodiversity Areas (KBAs) including Important Bird and Biodiversity Areas (IBAs) (IBAs form the core part of the KBA network), and Important Marine Mammal Areas (IMMAs).

There also exist Area-based Management Tools (ABMTs) which have long been used as a mechanism for regulating human activities which might impact biological diversity, within a particular area. These include Particularly Sensitive Sea Areas (PSSAs; shipping), Vulnerable Marine Ecosystems (VMEs; fishing) and Areas of Particular Environmental Interest (APEIs; deep-sea mining).

Many areas of biological or ecological importance have been described both within the EEZs of coastal States and ABNJ. In the Southeast Atlantic a total of 12 VMEs have been established in the area of the Southeast Atlantic Fishing Organisation (SEAFO) (FAO Major Fishing Area 47), with some overlapping with areas further north (FAO Major Fishing Area 34) (Figure 1). In addition, six EBSAs and two marine IBAs have been designated in the Southeast Atlantic. With regard to deep-sea mining and APEIs, the International Seabed Authority (ISA) presented a preliminary strategy for the development of Regional Environmental Management Plans for seamounts in the Mid-Atlantic Ridge and South Atlantic.

There is an ecological connection between coastal waters and ABNJ, which needs to be recognised in the identification, development and implementation of marine conservation measures and sustainable management plans. Additional areas of special ecological importance will most likely be identified in the future, as more areas are studied and understood, including in ABNJ. Increasing the knowledge base on such areas will contribute towards a comprehensive governance approach towards marine biological diversity.

Areas of special biological or ecological importance could be used to inform the international process on a legally binding instrument for the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (BBNJ). For example, such information could be used to inform marine spatial planning (MSP) processes or the identification of potential locations for marine protected areas (MPAs) to conserve and sustainably manage marine biological diversity in ABNJ.

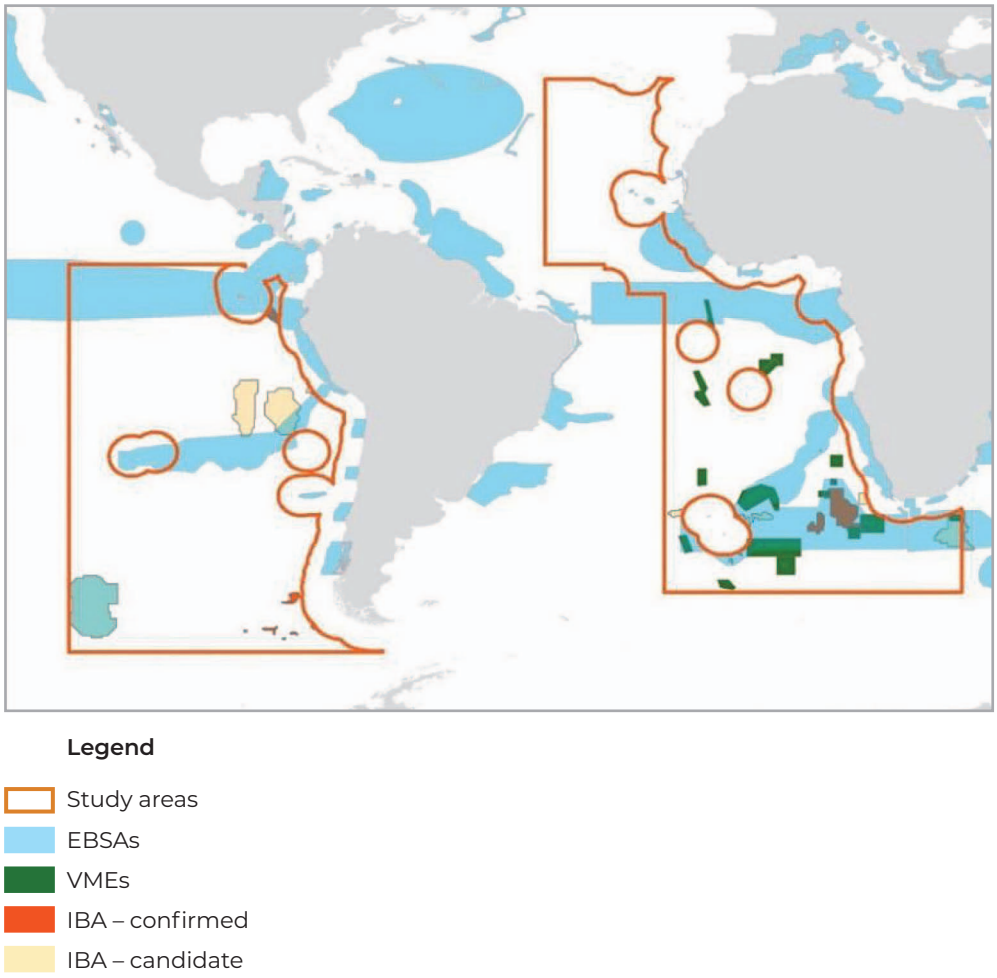

Figure 1: Areas of special ecological importance in the Southeast Atlantic and Southeast Pacific
Source: Map elaborated based on FAO, BirdLife International and CBD data

Areas of geological importance

The seabed in ABNJ (referred to as 'the Area') provides a unique habitat for a variety of fragile deep-sea species and communities but also is highly rich in mineral deposits formed over extremely long timescales. It contains a range of areas of geological importance, in particular seamounts, hydrothermal vents and manganese nodule fields. These geological features are associated with different types of marine mineral resources, in particular: (i) polymetallic manganese nodules, (ii) cobalt-rich ferromanganese crusts, and (iii) polymetallic sulphides.

Demand for these minerals is particularly sought after for use in new technologies such as lithium-ion batteries and their demand is expected to increase in the future. Exploiting the marine mineral resources these areas contain could allow for the generation of short-term economic profits, but large-scale mining of marine mineral resources from the deep seabed is expected to have severe and long-lasting impacts on the marine environment and ultimately human well-being.

The Southeast Atlantic deep-ocean basin is mainly characterised by deep seafloor and

contains areas of geological importance with marine mineral resources (Figure 2). However, knowledge about the exact location of deposits remains limited due to the vast extent of deep ocean basins and the limited number of surveys conducted. Knowledge gaps also remain regarding the complex ecological and biogeochemical processes and interactions between geological features and biological systems in the deep ocean.

The regulatory framework for the exploitation of these minerals is currently under development by the International Seabed Authority (ISA) and is a prerequisite before any commercial mining activity could start in the Area. In addition to the development of a regulatory framework for commercial mining activity, the ISA is also developing a specific regional environmental management plan (REMP) for the entire Atlantic region.

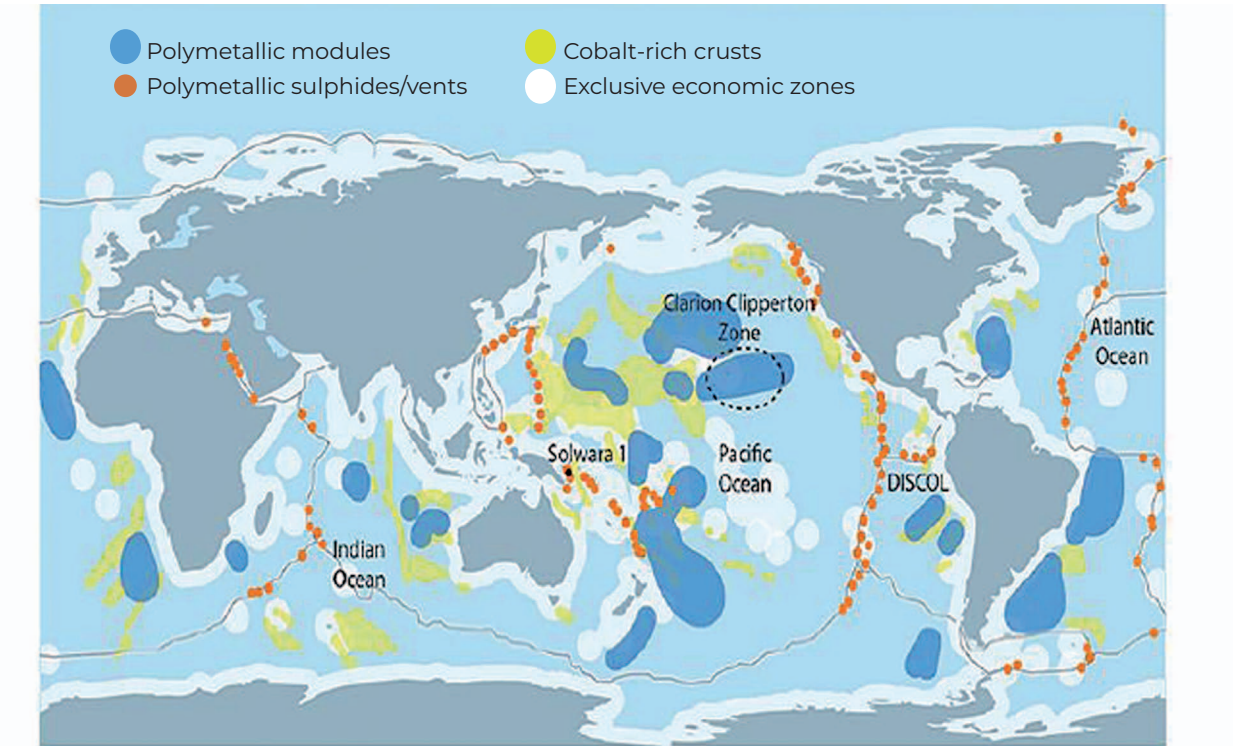

Figure 2: World map showing the location of the three main marine mineral deposits: polymetallic nodules (blue); polymetallic or seafloor massive sulphides (orange); and cobalt-rich ferromanganese crusts (yellow)
Source: Miller et al., 2018

Seabed habitats (benthic) and water column habitats (pelagic)

Seabed benthic habitats support rich and diverse ocean communities and are some of the largest reservoirs of biomass and non-renewable resources (marine minerals) and host microbial processes that are essential for biogeochemical cycles. Most of the deep-sea ocean floor, including in the Southeast Atlantic, is vast, relatively flat expanses of abyssal seafloor, interspersed with features such as hydrothermal vents, ridges, seamounts and guyots (i.e. undersea mountains with a flat top). Soft deep-sea sediments cover 65% of the world's surface, which makes this type of habitat one of the most extensive in the world. It is believed that they contain a wealth of undiscovered biological diversity. Seamounts form biological hotspots with a distinct, abundant and diverse fauna and provide important feeding grounds for numerous species and thus also support fisheries.

The Southeast Atlantic deep-sea ocean floor includes relatively flat expanses of abyssal seafloor (e.g. Cape Verde Plain and the Angola Plain), interspersed with features including mid-oceanic ridges (e.g. Mid-Atlantic Ridge and the Walvis Ridge), hydrothermal vents, seamounts and guyots.

The Southeast Atlantic contains around 25% of Earth's seamounts, especially at the Mid-Atlantic Ridge, the Walvis Ridge and the Guinea Rise. About 700 seamounts have been predicted to occur in the region, but only a small fraction has been explored to date (Figure 3). The FAO Areas 47 and 34[2] have 5.4% and 20.1% of the world's seamounts, respectively, containing together more than a quarter (25.4%) of the world's seamounts (Zeller et al., 2016).

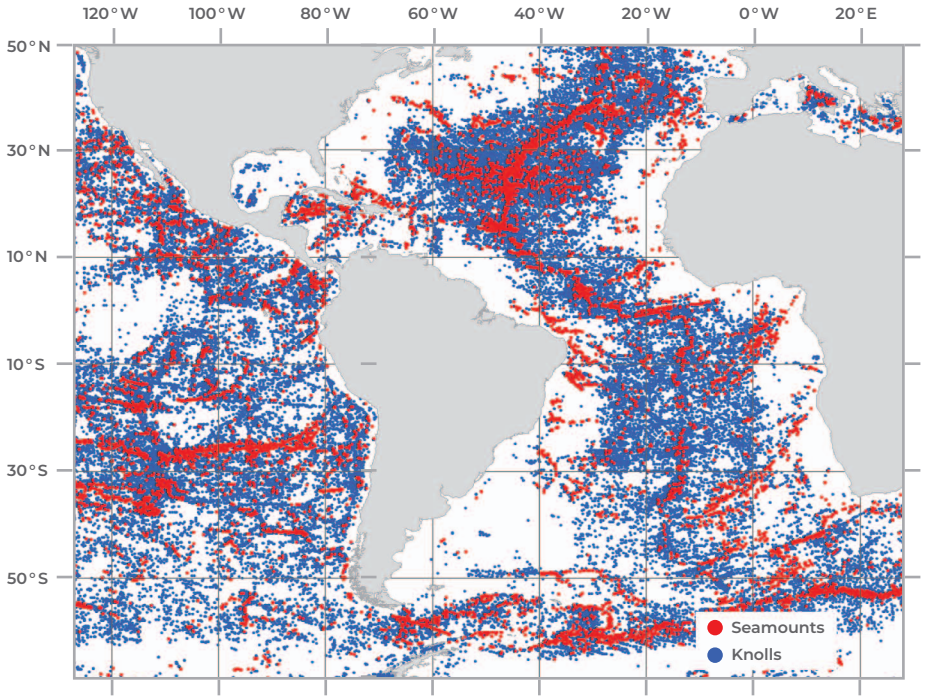

Figure 3: Seamounts in the Southeast Atlantic and Southeast Pacific
Source: Yesson et al., 2011

There are an important number of hydrothermal vent fields in the Southeast Atlantic, primarily along the Mid-Atlantic Ridge. Many remain largely unexplored, whereas some 3,412 active hydrothermal vents have been observed and a total of 7,629 exist (Figure 4). Hydrothermal vent fields provide habitats for communities, which generally present low levels of diversity but high levels of endemicity (i.e. specific to a certain area) as well as high biomass.

[2] FAO Major Fishing Areas: http://www.fao.org/fishery/area/search/en

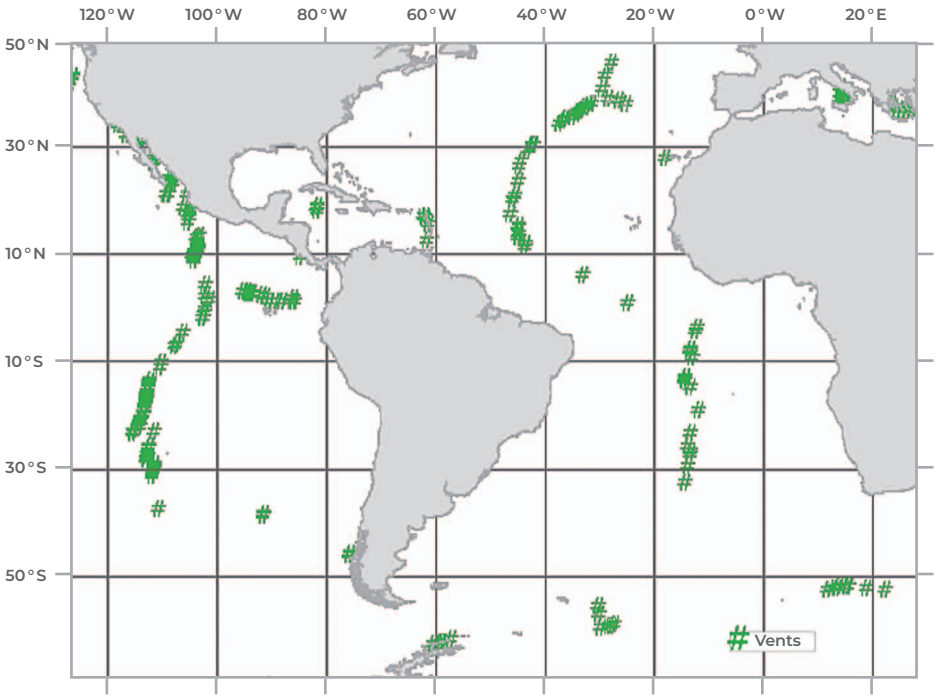

Figure 4: Active hydrothermal vents in the Southeast Atlantic and Southeast Pacific
Source: Active Submarine Hydrothermal Vent Fields (2019). Accessed August 14, 2019 from http://vents-data.interridge.org/maps

The water column habitats in ABNJ (i.e. pelagic open ocean waters) range from warm, light surface waters to cold, dark trenches and from continental margins to the farthest point offshore. These varied conditions paired with seasonal to multi-decadal patterns influence species distribution and productivity, thus creating variations in habitats. Marine organisms both take advantage of and influence oceanographic conditions – exchanging matter and energy. Scientific understanding of such processes is still in its early stages while new information and data from satellites are significantly improving assessments. Nevertheless, it is clear that the interconnectedness of carbon, nitrogen and other nutrient cycles and transport mechanisms, including through migratory species, such as whales and seabirds, reflects the importance of protecting species and sites as key nodes within an interconnected system. The Southeast Atlantic comprises diverse oceanographic systems, including the North Atlantic Subtropical Gyre (NASG), the Eastern Tropical Atlantic, the South Atlantic Subtropical Gyre, and the Sub Antarctic Atlantic system. The influence of West Africa coastal waters and coastal dynamics on ABNJ is especially relevant because coastal organic matter and nutrients enhance food webs in ABNJ.

The extraction of marine species including fish

Fishing is the most significant human activity taking place in ABNJ in terms of pressure on marine biological diversity and the majority of fish stocks in ABNJ are at an unprecedented low level. There is also a loss of genetic diversity due to the exploitation of fish populations, especially in vulnerable ecosystems (e.g. seamounts) while other types of resource exploitation (e.g. mining, energy) may also cause damage to habitats or feeding grounds.

While most fishing effort and biomass removal occurs within EEZs, there are massive fishing fleets targeting stocks in ABNJ. Fishing effort (mean hours per day) in ABNJ (Figure 5) has seen significant growth over the last 50 years, though has generally decreased since 2000, as new fishing technologies became available. As of 2019, tuna fisheries account for 61% of total global catches in ABNJ while non-tuna pelagic fishes account for 26% of total catches and pelagic squids 7% of total catches. Other main target species in ABNJ include blue shark and billfish (swordfish, marlin), and oilfish. Globally, major fishing fleets operating in ABNJ come

from China, Spain, Chinese Taipei (Taiwan), Japan and the Republic of Korea (South Korea). ABNJ provide about 4.2% of the total global annual marine capture fisheries. Some assessments suggest that fishing in ABNJ would, in many cases, not be profitable in the absence of government subsidies, and the continuation of payments is highly controversial amongst some countries within the World Trade Organization (WTO).

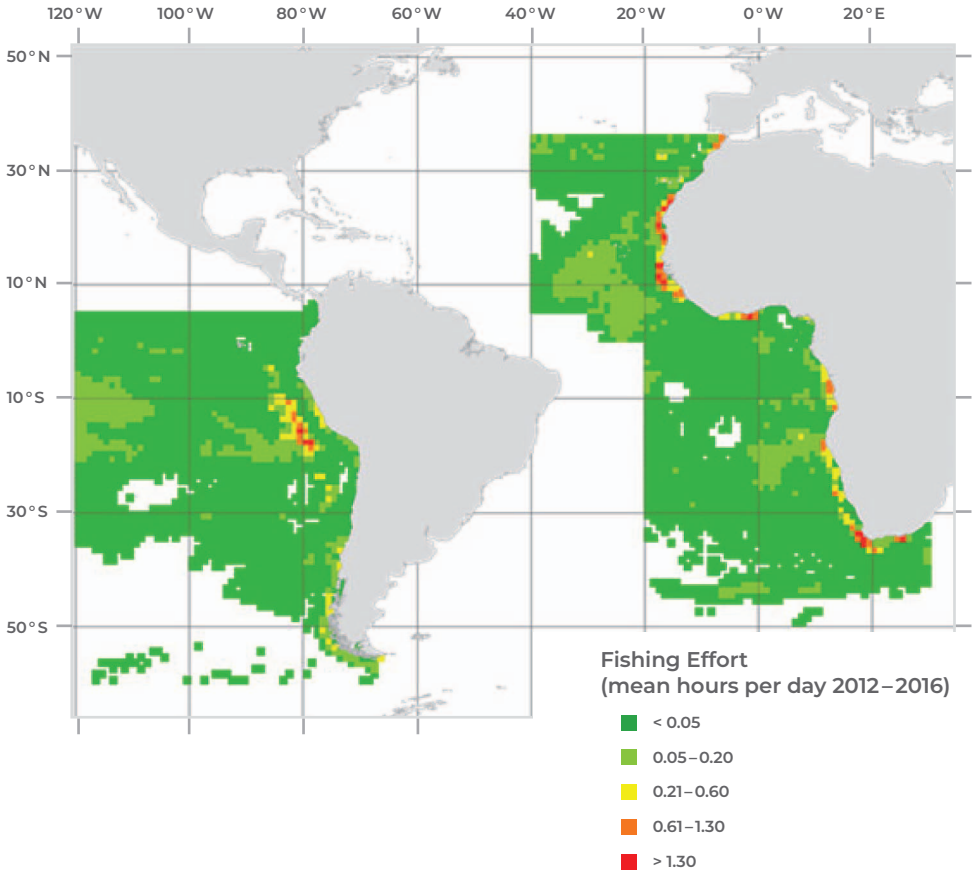

Figure 5: Fishing effort in the Southeast Atlantic and Southeast Pacific (2012–2016) (mean hours per day)
Source: Yesson et al., 2011

In the Southeast Atlantic, four areas of biological interest are especially important for fish: the Convergence Zone of the Canary Islands-Guinea currents, the Equatorial Tuna Production Area, the Walvis Ridge and the Subtropical Convergence Zone. In the Southeast Atlantic, catches from industrial fishing in ABNJ quadrupled from 200,000 tons in 1987 to >800,000 tons in 1990. After this record high, catches fell to around 400,000 tons per year. The majority of species targeted in the region are tunas as well as shark and sailfish. In 2014, the most active countries fishing in ABNJ of the Southeast Atlantic region in terms of catch were Saint Vincent and the Grenadines, Ghana, Spain, France, Japan, Panama, Chinese Taipei (Taiwan), Namibia, Republic of Korea and Portugal.

Many fish species are highly migratory and overfishing in ABNJ has serious biological impacts on fish species and in turn economic consequences for livelihoods and economies in coastal States. Reductions in commercial fish species numbers (i.e. abundance or stock levels) means not only a change in single species, but also that an entire ecosystem can be modified due to complex trophic web interactions (e.g. trophic cascades). However, information regard-

ing non-commercial fish species is far less available than for species that are of commercial interest, making complete species and food chain assessments challenging.

Marine mammals and other megafauna

As in other regions, the Southeast Atlantic is rich in marine megafauna and is thus an area of specific concern in terms of conservation (Figure 6). Of the 37 species of marine mammals found in the Southeast Atlantic, four are considered *Endangered*, three *Vulnerable*, 13 *Least Concern*, and 17 as *Data Deficient*, according to the categorizations of the International Union for the Conservation of Nature (IUCN). Similarly, one sea turtle species is considered *Critically Endangered* – the Hawksbill, one is considered *Endangered* – the Green, and the three others – the Loggerhead, the Olive ridley, and the Leatherback are considered *Vulnerable* (Polidoro et al., 2017).

Marine mammal populations are slowly recovering, but commercial whaling has fundamentally altered marine ecosystems and it is not possible to predict to what extent populations might recover. Sea turtle populations continue to decline, mostly due to fishing bycatch of non-targeted species. As they are a key component of marine biological diversity, it is expected that their decline will lead to significant changes in ecosystem functioning. The most significant threat to marine megafauna in ABNJ is bycatch caused by commercial fisheries, while pollution is also a major threat and ship strikes also pose a threat.

Most information on migratory routes of marine megafauna has been collected in coastal areas. However, marine megafauna can cover enormous distances, spending parts of their life cycle in ABNJ and parts in EEZs, for example, Leatherback turtles tagged in Gabon, spent most of their time in ABNJ (Witt et al. 2011) but also passed through the EEZs of at least 11 countries in the Southeast Atlantic.

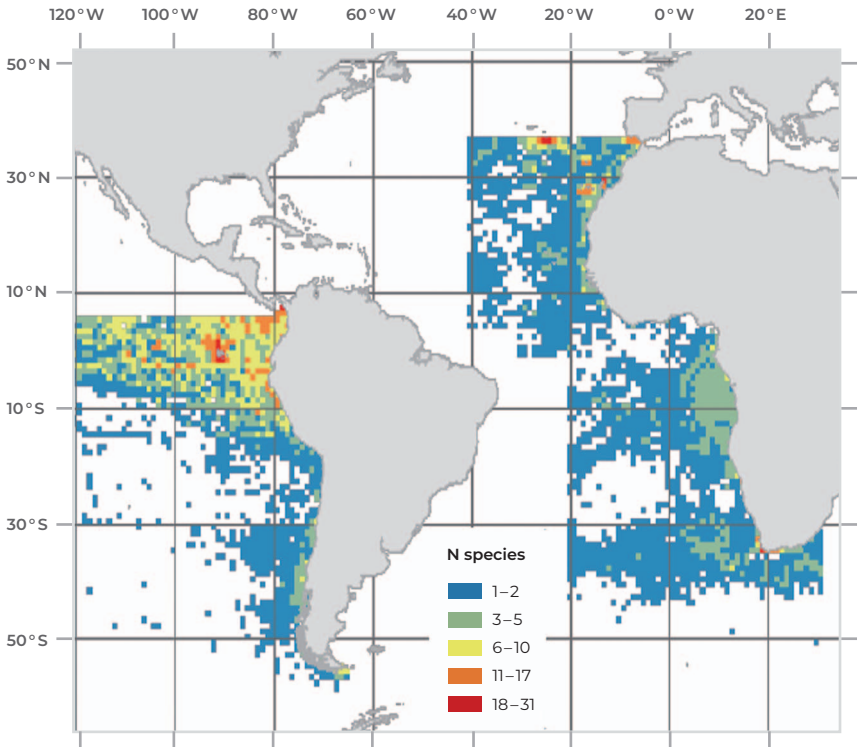

Figure 6: Megafauna species richness in the Southeast Atlantic and Southeast Pacific
Source: OBIS SEAMAP, 2019

Seabirds

Most seabirds exhibit highly migratory lifestyles and spend significant time in ABNJ. Seabirds are subject to threats and pressures both from terrestrial and marine sources. The IUCN Red List Index for seabirds demonstrates that they have the worst status of all birds on Earth. Figure 7 shows the number of globally threatened seabird species classified as *Vulnerable, Endangered* or *Critically Endangered* in the IUCN Red List in the Southeast Atlantic and Southeast Pacific. Accidental mortality from fishing bycatch is the single biggest threat to seabirds in ABNJ. Due to the distances they travel, seabirds come in contact with a large number of fishing fleets as well as other threats. Much is unknown about indirect pressures on seabirds, such as reduced fish stocks from fisheries or how climate change might disrupt migration systems or food availability.

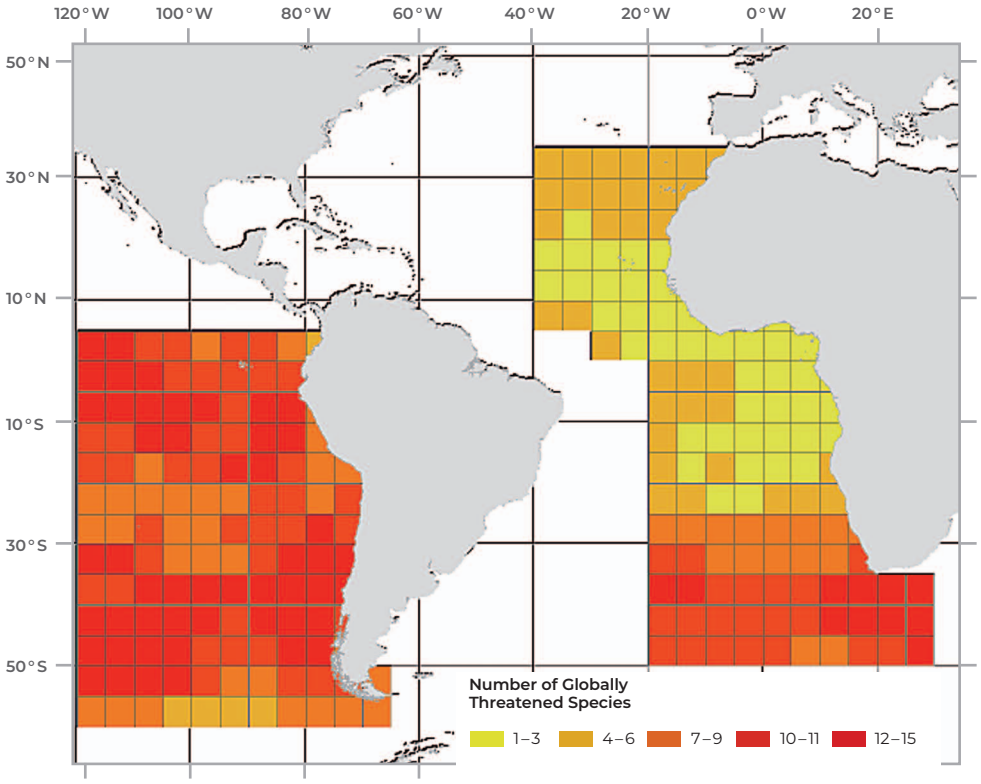

Figure 7: Number of globally threatened seabird species classified as Vulnerable, Endangered or Critically Endangered in the IUCN Red List in the Southeast Atlantic and Southeast Pacific
Source: BirdLife International, 2019

Population trends for most seabirds are generally poor – downward or stable, and there are few exceptions to this. Within the Southeast Atlantic (study area), 20 globally threatened seabird species occur regularly with significant presence in the area (i.e. excluding species with marginal overlap) (Table 1).

Table 1: Threatened seabird species in the Southeast Atlantic
Source: BirdLife International, 2019

Seabird species	Critically Endangered	Endangered	Vulnerable
Ascension frigatebird			●
Atlantic Yellow-nosed albatross		●	
Bermuda petrel Atlantic petrel		●	
Desertas petrel			●
Grey-headed albatross		●	
Indian Yellow-nosed albatross		●	
Leach's Storm petrel			●
Macaroni penguin			●
MacGiliviray's Prion		●	
Northern rockhopper penguin		●	
Northern royal albatross		●	
Salvin's albatross			●
Sooty albatross		●	
Southern royal albatross			●
Spectacled petrel			●
Trindade petrel			●
Tristan albatross	●		
Wandering albatross			●
White-chinned petrel			●
Zino's petrel		●	

Physical disturbance to and destruction of the seabed

Physical disturbance and destruction of the seabed are caused by deep-sea fishing (bottom trawling), the laying of underwater cables, and potentially deep-sea mining (still considered in the exploration phase as no exploitation licenses have yet been issued). Although there is no UN resolution banning bottom trawling, the majority of fisheries using this technique have been brought to an end, while the laying of cables is considered to cause negligible damage to seafloor biological diversity (A/RES/61/105). Nevertheless, deep sea mining has the potential to cause significant destruction and disturbance to the seabed if opened up for commercial exploration. A precautionary approach to mining should be taken given the number of unknowns.

In the Southeast Atlantic, fishing is predominantly done by purse seines and longlines, causing limited or negligible disturbance or destruction of the seabed. Underwater cables are minimally distributed throughout the Southeast Atlantic, compared to other ocean spaces (Figure 8). However, several areas in ABNJ in the Southeast Atlantic contain marine mineral resources, creating potential for destructive deep-sea mining for short-term gains.

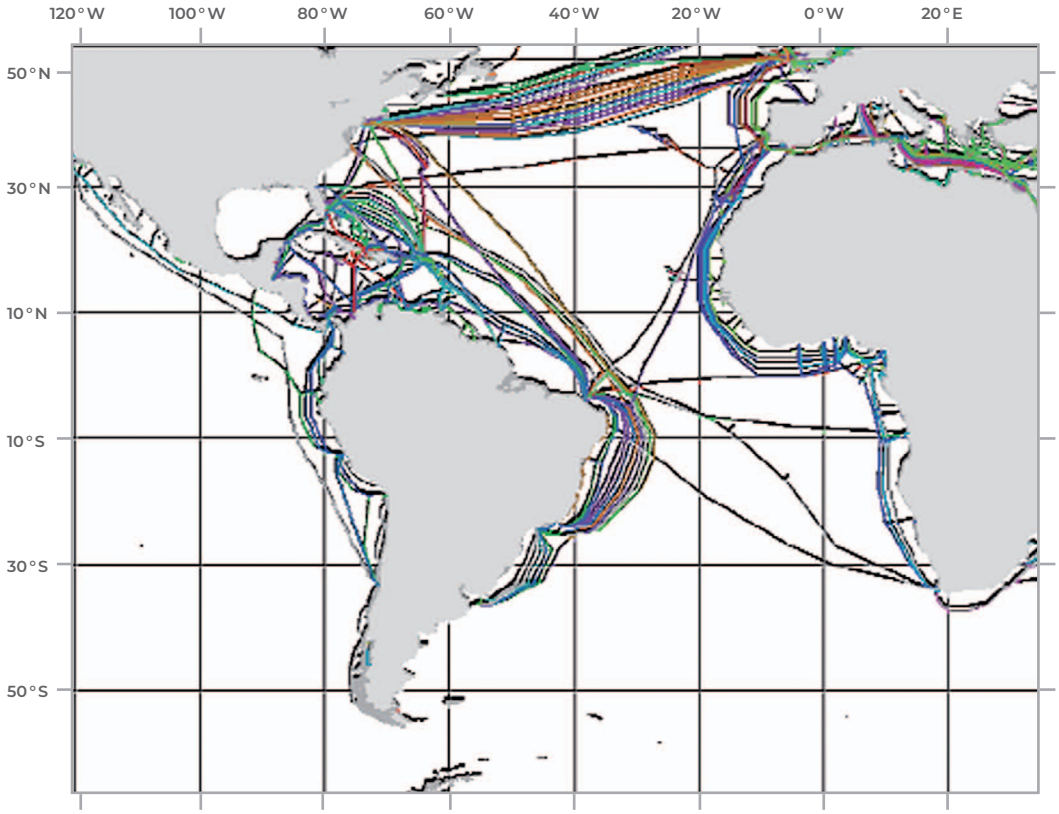

Figure 8: Submarine cables in the Southeast Atlantic and Southeast Pacific
Source: Submarine Cable Map (2019). Telegeography. Accessed August 14, 2019 from https://submarine-cable-map-2019.telegeography.com/

Marine pollution

Pollution is a major threat to marine biological diversity - about 80 % of pollutants stems from land-based activities, while other sources include marine activities such as shipping (e.g. oil leaks or spills) and fishing (e.g. debris such as lost nets). Although deep-sea mining is still in its infancy and there is a limited understanding of potential impacts, it is expected that mining activities will result in plumes of suspended material and the release of potentially toxic elements which could travel significant distances. Within the Southeast Atlantic, there is strong evidence that there are areas of concentrated debris in the South Atlantic Gyre.

Contaminants of concern in ABNJ include hazardous substances (e.g. heavy metals, pesticides), suspended solids, hydrocarbons and marine litter (primarily plastics and micro-plastics). Information on pollution levels is limited. Nevertheless, there is sufficient information to suggest that ABNJ are contaminated with a range of pollutants, causing the degradation of ecosystems and also compromising human health. Hazardous substances, including the heavy metal mercury, have been detected in deep-sea fish, and tributyltins (i.e. chemicals commonly found in materials such as anti-fouling ship paints) are present in sediments along busy shipping lanes as well as ports (Figure 9). Marine debris – especially plastic – is transported by winds and currents. Heavier debris, or debris that has accumulated weight from organisms settling on it, sinks and has been reported in numerous deep-sea areas. Marine debris poses a threat to marine life, primarily through entanglement and ingestion. Marine debris is also a vector for the translocation of alien species across the oceans.

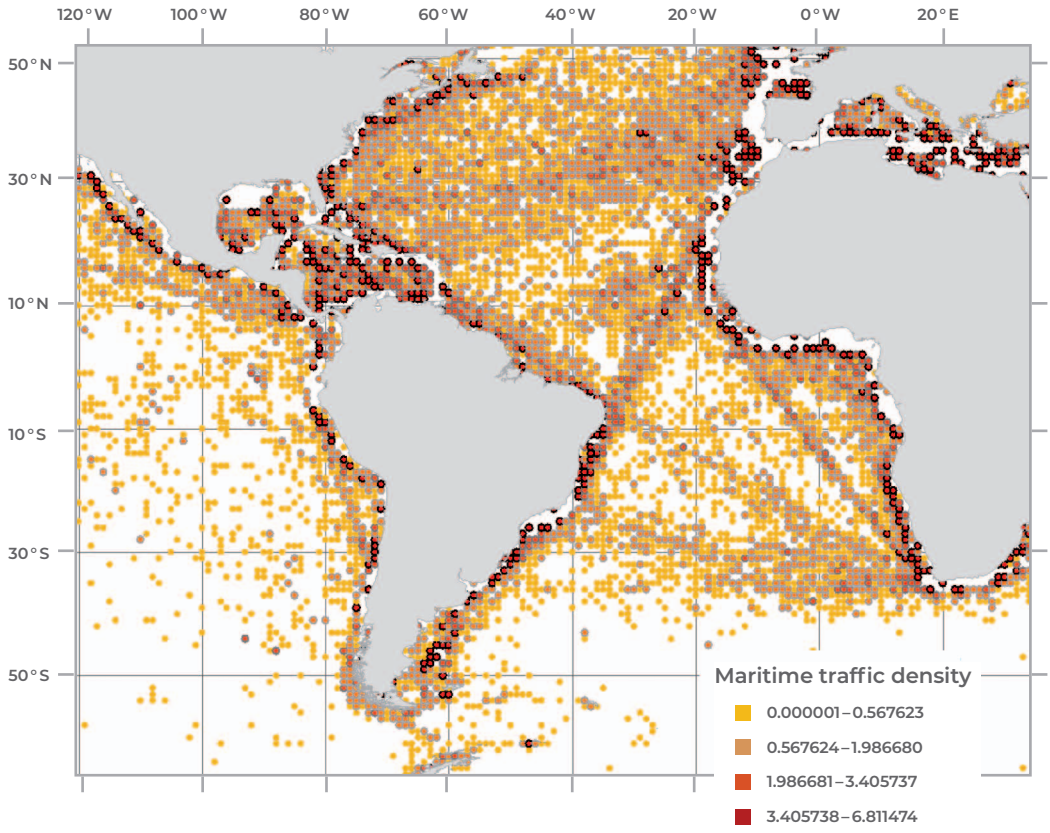

Figure 9: Maritime traffic density in the Southeast Atlantic and the Southeast Pacific
Source: European Commission, 2010

Information for the Southeast Atlantic is primarily out of South Africa and Namibia. Studies in West Africa are more limited, and are largely focussed on coastal areas. Scheren et al. (2002), for example, reported that a beach debris monitoring programme in the Gulf of Guinea region found that plastics (e.g. fishing related products, packing materials, and carrier bags) make up 62 % of the waste. The average number of items found on the beaches was 23/m^2. Extremely limited information, if any, on floating marine litter is available from the areas between the gyres of the South and North Atlantic although there are some reports on marine debris in coastal areas – for example, off the coast of continental Nigeria (Oguguah et al., 2011). Information on debris in the deep-sea areas is even scarcer with the only study found being that on the surrounds of the Atlantic Ridge (Woodall et al., 2015).

Underwater energy, including noise

A range of activities introduce anthropogenic energy – including sound, light, heat, and radioactive energy – into the marine environment. The most widespread and pervasive kind of anthropogenic energy is underwater noise. Main activities generating underwater noise in ABNJ are related to maritime transport, including cargo shipping, fishing, or passenger vessels, and military exercises, as well as potentially oil and gas exploration and exploitation. Another potential source of emissions of anthropogenic energy is submarine cables, though their numbers, especially in the Southeast Atlantic is limited (Figure 8).

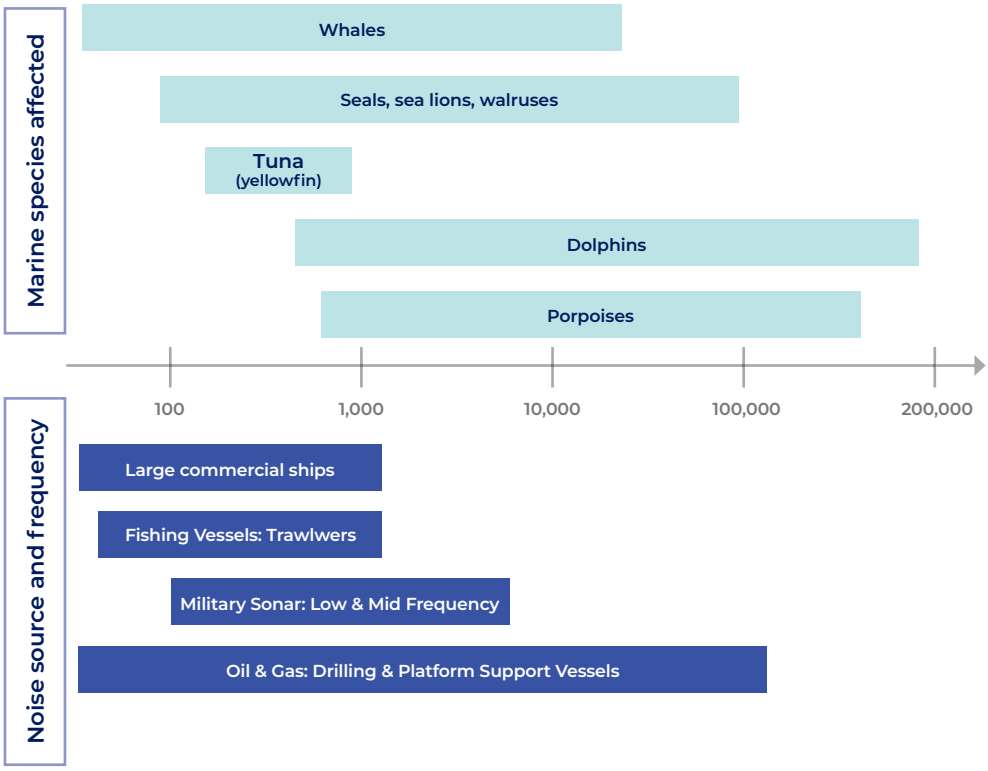

Figure 10: Audiogram for selected species and ship types (Hz)
Source: Own elaboration based on, Evans and Nice, 1996; Hildebrand, 2009; Malme, 1989; Nedwell et al., 2003; OSPAR, 2009; Richardson et al., 1991; Sarà et al., 2007; Southall et al. 2017; Zimmer, 2004

There exists a range of adverse effects on marine species due to underwater noise, including interference with key biological functions such as communication, foraging, reproduction, navigation, and predator avoidance. The predominantly low-frequency sounds associated with large vessels directly overlap typical low-frequency communication sounds and hearing of many marine mammals, particularly of large whales and some seals and sea lions (Figure 10). However, there are still substantial knowledge gaps, including how underwater noise affects marine species like fish or invertebrates. There exists even less information on the impacts of light, heat, and radioactive energy.

Climate change

According to the 2019 IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (IPCC, 2019), the global ocean has continually warmed since 1970 and absorbed more than 90 % of the excess heat in the climate system, with the rate of ocean warming doubling since 1993. Moreover, due to absorbing CO_2 from the atmosphere, marine heatwaves have very likely doubled in frequency since 1982 and are increasing in intensity. There is also increasing surface acidification and a loss of oxygen from the surface to 1000m depth.

Climate change is significantly affecting the marine environment including in ABNJ and altering its regulation capacity. Fish stocks are expected to shift towards higher latitudes as the climate warms, leading to changes in metabolism that would impact life cycles and rates such as faster growth and lower maximum size. Overall, fisheries production is expected to decrease about 10 % due to climate change. Fishing pressure will further affect stock numbers for certain species, and some species are expected to entirely disappear. At present, there is uncertainty around the genetic capacity of fish species to adapt to changing environments.

Ocean conservation and management regimes must consider both climate change effects and ecological connectivity to be effective at conserving marine biological diversity in ABNJ. Understanding the implications of both is important for managing the socioeconomic impacts of climate change. Fisheries catches will likely experience a net decrease, due to climate change, though this will not be geographically consistent. It is important to know how different regions are affected and how to account for ecological connectivity. This requires forward thinking and innovative approaches for management (Popova et al., 2019).

Climate scenarios for the Southeast Atlantic indicate with relatively high levels of certainty that significant ocean warming will take place in the region. It is predicted that most of the fish and invertebrates in the Southeast Atlantic will shift northwards 52.1 kilometres on average per decade between 2005 and 2050 with knock on implications for fisheries (Cheung et al., 2010).

The effects of climate change on ocean dynamics should not be considered in isolation, because ocean processes themselves are modulating climate change. Instead, it is important to consider the rate at which ocean circulation and biogeochemical processes are changing.

Cumulative pressures

ABNJ, as with the marine environment in general, are in a precarious state. Pressures stemming from human activities continue to cause significant and potentially irreversible damage to marine biological diversity. While it is essential to review and assess pressures individually to clearly present evidence, pressures must also be considered cumulatively. Cumulative pressures on the marine environment from human activities affect ecosystems in complex ways, and combinations of pressures can lead to negative environmental effects that exceed their individual effects. Ecosystem-based management is a way to better identify and account for the cumulative pressures of multiple activities, by recognising the different pressures causing change, and how they interact (Figure 11), and then developing management approaches which consider such pressures holistically across different spatial and temporal scales.

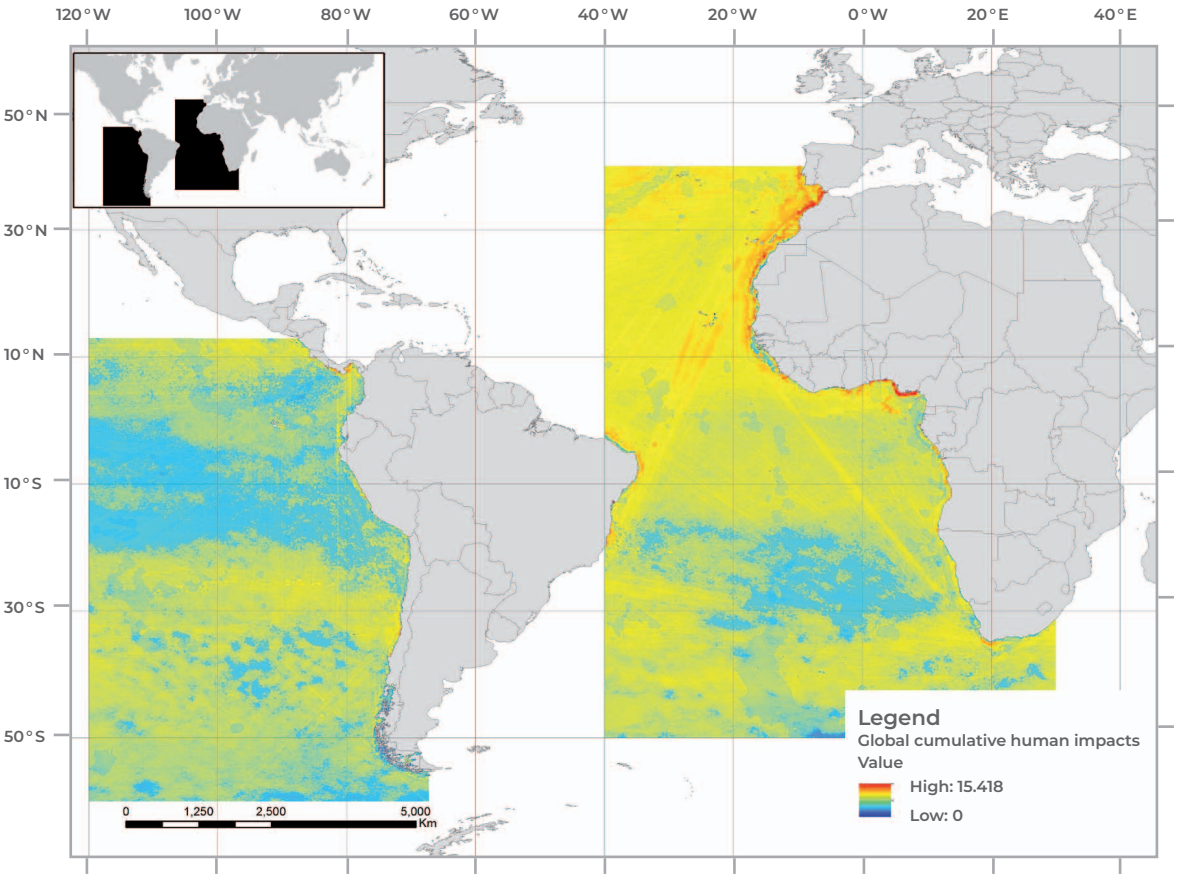

Figure 11: Spatial cumulative human impacts in the Southeast Atlantic and Southeast Pacific
Source: Halpern et al. (2015)

Note: Spatial and temporal changes in cumulative human impacts on the world's ocean.
Data from KBN Ecoinformaticsal., 2007; Southall et al. 2017; Zimmer, 2004

3) Summary

- The ocean is vital to all life on the planet and its health is interconnected with human well-being. Marine biological diversity in Areas Beyond National Jurisdiction (ABNJ) is threatened by intensifying human activities, making it necessary to rethink how to effectively and sustainably manage over half of the Earth's surface.

- Areas Beyond National Jurisdiction and national waters (or Exclusive Economic Zones) are ecologically connected, meaning that disturbances to marine biological diversity can have effects far beyond the immediate area of impact. Ecological connectivity is essential to healthy marine ecosystems across the globe and demands transboundary and multi-sectoral governance approaches for the conservation and sustainable use of biological diversity, based on ecologically defined management units rather than jurisdictional boundaries.

- The ecological connection between coastal waters and ABNJ must be recognised when identifying, developing and implementing measures for marine conservation and sustainable management. Areas identified as special biological or ecological importance could be used to inform the international process currently underway at the United Nations on a legally binding instrument for the conservation and sustainable use of marine biological diversity in ABNJ.

- Marine minerals are formed over extremely long timescales and provide unique habitats for a variety of fragile deep-sea species. Short-term economic gains potentially made by exploiting marine mineral resources are not expected to outweigh the long-lasting impacts mining activities would have on the marine environment and ultimately on human well-being.

- Seabed benthic habitats support rich and diverse ocean communities, containing some of the largest reservoirs of biomass and non-renewable resources (marine minerals) on the planet as well as hosting microbial processes that are essential for biogeochemical cycles. The water column (pelagic habitats) ranges from warm, light surface waters to cold, dark trenches and from continental margins to the farthest point offshore, creating numerous variations in habitats and influencing marine species distribution and productivity. Effective conservation and sustainable management goals require that the interconnectedness of the marine ecosystem and especially key nodes within this system are understood, monitored and protected.

- Of all human activities taking place in ABNJ, commercial fishing currently causes the most significant pressure on marine biological diversity and the majority of fish stocks in ABNJ are at an unprecedented low stock level. Although the majority of fishing occurs within coastal areas, many fish species are highly migratory and overfishing in ABNJ has serious biological impacts on fish species which can lead to socioeconomic losses for coastal States as well as degrade the livelihoods of coastal populations dependent upon these resources.

- Many marine mammals and other megafauna (such as turtles) are in a precarious state and are threatened by human activities such as fishing and pressures such as pollution as well as by fundamental changes to the marine ecosystem and their habitats. Such species play an important role in maintaining the ecological and trophic balance and their decline will lead to significant changes in the overall marine ecosystem functioning. Because these species cover enormous distances during migration, traversing large portions of the planet, it is important to understand how their spatial and temporal patterns

across the ocean to design and implement adequate conservation and sustainable management measures.

- There is a tremendous diversity of seabird communities in all ocean regions, and most seabirds are highly migratory, spending a significant amount of their time in ABNJ. Many of these species are in a critical state and are threatened by the numerous human activities (both terrestrial and marine) in which they are exposed to, with fishing remaining their largest threat when in ABNJ. Because seabirds typically cover large geographical areas during migration, the use of area-based management tools (ABMTs) alone to protect and conserve them throughout their migration may have limited impact on some species. Complementary measures at a seascape level are needed and fundamental to some species conservation over time.

- Information on pollution levels in the marine environment is limited, though there is sufficient information to indicate that ABNJ are contaminated with a range of pollutants, causing the degradation of ecosystems and also compromising human health. The majority of marine pollution stems from land-based activities, while other sources include marine activities such as shipping and fishing.

- The most widespread and pervasive kind of anthropogenic energy in the marine environment is underwater noise – predominantly related to maritime transport, which can cause interference with key biological functions such as communication, foraging, reproduction, navigation, and predator avoidance to marine species, especially marine megafauna. However, there are still substantial knowledge gaps, including how underwater noise affects marine species like fish or invertebrates.

- Climate change is significantly affecting the marine environment – both in ABNJ and coastal areas. Fish stocks are expected to shift towards higher latitudes due to climate change and it is predicted to lead to a decrease of about 10 % in overall fisheries production as well as further affect stock numbers for particular species and cause some species to entirely disappear. However, the effects of climate change on ocean dynamics should not be considered in isolation, because ocean processes themselves are modulating climate change.

- Cumulative pressures on the marine environment affect ecosystems in complex ways, and certain combinations of pressures may lead to negative environmental effects that far exceed their individual effects.

- Many gaps in knowledge exist and must be filled in order to support a comprehensive and appropriate management approach for the conservation of marine biological diversity in ABNJ. At the same time, such gaps in knowledge are not a justification for delaying coordinated and cross-sectoral policy action as existing information provides the basis for decision making and action.

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About the STRONG High Seas project

The STRONG High Seas project is a five-year project that aims to strengthen regional ocean governance for the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction. Working with the Secretariat of the Comisión Permanente del Pacífico Sur (CPPS; Permanent Commission for the South Pacific) and the Secretariat of the West and Central Africa Regional Seas Programme (Abidjan Convention), the project will develop and propose targeted measures to support the coordinated development of integrated and ecosystem-based management approaches for ocean governance in areas beyond national jurisdiction (ABNJ). In this project, we carry out transdisciplinary scientific assessments to provide decision-makers, both in the target regions and globally, with improved knowledge and understanding on high seas biodiversity. We engage with stakeholders from governments, private sector, scientists and civil society to support the design of integrated, cross-sectoral approaches for the conservation and sustainable use of biodiversity in the Southeast Atlantic and Southeast Pacific. We then facilitate the timely delivery of these proposed approaches for potential adoption into the relevant regional policy processes. To enable an interregional exchange, we further ensure dialogue with relevant stakeholders in other marine regions. To this end, we set up a regional stakeholder platform to facilitate joint learning and develop a community of practice. Finally, we explore links and opportunities for regional governance in a new international and legally binding instrument on marine biodiversity in the high seas.

Project duration: June 2017 – May 2022
Coordinator: Institute for Advanced Sustainability Studies (IASS)
Implementing partners: BirdLife International, Institute for Sustainable Development and International Relations (IDDRI), International Ocean Institute (IOI), Universidad Católica del Norte, WWF Colombia, WWF Germany
Regional partners: Secretariat of the Comisión Permanente del Pacífico Sur (CPPS), Secretariat of the Abidjan Convention
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Partners of the STRONG High Seas project: