Regular Process for the Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects

Technical Abstract of the

First Global Integrated Marine Assessment

on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction

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Purpose and process of preparing the Technical Abstract

This Technical Abstract is based upon the First Global Integrated Marine Assessment – World Ocean Assessment I – released in January 2016, and, in particular, upon the Summary of that Assessment, which was approved by the United Nations General Assembly in December 2015.[1] It has been prepared in accordance with the programme of work for the period 2017-2020 for the second cycle of the Regular Process which was adopted by the Ad Hoc Working Group of the Whole on the Regular Process in August 2016 and endorsed by the General Assembly in December 2016.[2] This provides for, inter alia, support for other ongoing ocean-related intergovernmental processes, including the preparation of Technical Abstracts specifically tailored to meet the needs of, among other intergovernmental processes, the work under General Assembly resolution 69/292: Development of an international legally-binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. The purpose of this Technical Abstract is to provide scientific, factual background to the issues being discussed in these processes. In this regard, the Technical Abstract provides a synthesis of the information in World Ocean Assessment I and does not introduce any new material or interpretation of the information presented in World Ocean Assessment I.[3]

This Technical Abstract has been prepared by the Group of Experts for the second cycle of the Regular Process, on the basis of an outline prepared by the Group of Experts and discussed by the Bureau of the Ad Hoc Working Group of the Whole on the Regular Process. Some members of the Pool of Experts of the Regular Process who contributed to World Ocean Assessment I were part of the review process, together with the Group of Experts, the secretariat of the Regular Process – the Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs – and the Bureau of the Ad Hoc Working Group of the Whole on the Regular Process. The secretariat also assisted in the finalization of the Technical Abstract by the Group of Experts. The Bureau of the Ad Hoc Working Group of the Whole has considered an advance, unedited version of the Technical Abstract for presentation to delegates attending the third session of the Preparatory Committee established by resolution 69/292.

[1] See General Assembly resolution 70/235, paragraph 266. The full text of the World Ocean Assessment, including the Summary, is available at http://www.un.org/depts/los/rp.
[2] See General Assembly resolution 71/257, paragraph 299.
[3] Note that though not represented in World Ocean Assessment I, Figure 1 and Figure 2 have been included for illustrative purposes only to depict the areas referred to in the Technical Abstract.

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under the auspices of the United Nations General Assembly and its Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects

1. Main issues

1. The areas beyond national jurisdiction are estimated to cover about 60 per cent of the Earth's surface. They are deep, with an average depth of more than 4 kilometres, and a maximum of over 10 kilometres. They form part of a single, interconnected world ocean.

2. Since there is life throughout the ocean, the areas beyond national jurisdiction represent around 95 per cent of the habitat occupied by life on Earth in all its forms. The biodiversity of these areas includes more of the major divisions of the forms of life than land ecosystems.

3. A lot has been learned, but much less than one millionth of the water column and seabed in these areas has been studied in detail. The complexity of the processes and functions of their ecosystems is only partly understood. More scientific investigation is needed. Nevertheless, research so far shows how the ocean has changed in recent decades and centuries. It also reveals likely future trends.

4. The world ocean is closely linked with the atmosphere, with both influencing the other. Climate change, through its warming and acidification, is likely to have profound and unpredictable effects on marine organisms and ecosystems. The distribution of fish and other species is already changing in response to rising temperatures. Warming oceans and air temperatures are reducing or eliminating sea ice in polar regions. Organisms with calcareous structures will be challenged by ocean acidification. Such changes are likely to have dramatic consequences for all marine ecosystems, particularly for polar regions and coral reefs.

5. The ecological processes in the deep ocean are slow. If they are disrupted by, for example, fishing, mining, or climate change, recovery will be slow and the resilience of ecosystems will be weakened.

6. Oceanic primary production by photosynthesis is vital to the world's supply of oxygen and is the basis of nearly all life in the ocean. The great expanses of areas beyond national jurisdiction support a very large proportion of this production, as well as the vertical processes through which nutrients essential for photosynthesis are recycled. Climate change is likely to impose alterations on primary production.

7. There is an environmental continuum from the land through waters under national jurisdiction to areas beyond national jurisdiction. Many species use all of these different areas at different stages of their life cycles. Pollutants from land, including marine debris, reach and affect organisms in areas beyond national jurisdiction. Marine debris, 80 per cent of which has a terrestrial origin, is a particular problem in such areas. It breaks down into microparticles and nanoparticles, which are passed up the food web, with largely unknown effects. Larger pieces of debris entangle and drown larger creatures.

8. Areas beyond national jurisdiction provide many benefits, such as food. The distribution around the world of the benefits drawn from the ocean is still very uneven. Gaps in capacity-building hamper less developed countries in taking advantage of what the ocean can offer them.

9. Research so far indicates management options which are likely to be ecologically more sustainable. However, sustainable use also requires the capability to address the factors that degrade the ocean.

2. Structure of the ocean in areas beyond national jurisdiction

10. The ocean is a single interconnected body of water, covering just over 7/10ths of the planet, and containing 97 per cent of all the water on the surface of the Earth. It is divided into four main ocean basins: the Arctic Ocean, the Atlantic Ocean, the Indian Ocean and the Pacific Ocean. The southernmost parts of these are connected by the strong Antarctic Circumpolar Current, creating an area with consistent physical, chemical and biological conditions. Together, they are considered as the Southern Ocean. The tectonic plates whose movement over the Earth's mantle have created the ocean basins have differing forms at their edges, giving broad or narrow continental shelves and varying profiles to the continental slopes leading down to the continental rises and the abyssal plains. Geomorphic activity in the abyssal

plains between the continents gives rise to mid-ocean ridges, volcanic islands, seamounts and trenches *(Chapter 1)*.[4]

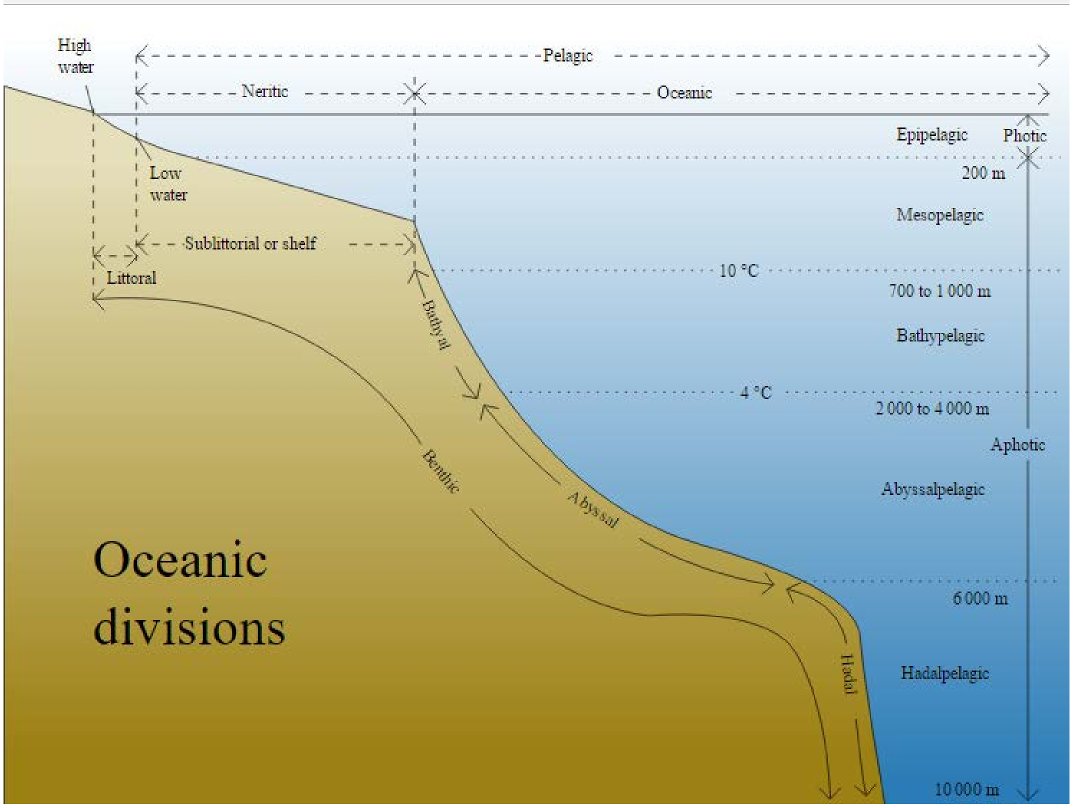

Figure 1: The divisions of the ocean[5] *Source: Chris Huh, Wikimedia Commons (2017)*

[In the text, terms illustrated in this diagram are marked by SMALL CAPITALS]

11. The limits of areas under national jurisdiction in the ocean are set out in the United Nations Convention on the Law of the Sea (UNCLOS). These areas are the internal waters, the territorial sea, the contiguous zone, the archipelagic waters of archipelagic States, the exclusive economic zone (EEZ) and the continental shelf (Figure 2). UNCLOS sets out the rights and obligations of States in these areas.

12. Under UNCLOS, the areas beyond national jurisdiction are the high seas and the Area. The high seas are all parts of the sea that are not included in the EEZ, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State. The Area is the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction.

13. In the Southern Ocean, the Antarctic Treaty applies to the area south of 60º South Latitude.

14. With the exception of some aspects of the continental shelf beyond 200 nautical miles, the limits of the maritime zones established by UNCLOS are not based on geomorphic criteria. There is an important distinction between the scientific terminology and the legal terminology. The areas beyond national jurisdiction cover a wide range of geomorphic forms. From a scientific perspective, in parts of the

[4] In the present Technical Abstract, the chapters referred to are chapters of parts II to VII of World Ocean Assessment I. This can be found at www.un.org/depts/los/rp. When placed at the end of a paragraph, such references apply to all preceding paragraphs up to the previous such reference. The citations on which the paragraphs are based can be found in those texts.

[5] See https://commons.wikimedia.org/wiki/File:Oceanic_divisions.svg.

ocean with broad continental margins, parts of the continental margin may lie beyond the limits of national jurisdiction from a legal perspective. Some of the terminology used to describe the various divisions of the ocean from a scientific perspective and the maritime zones under UNCLOS are illustrated in Figures 1 and 2 respectively *(Chapter 1).*

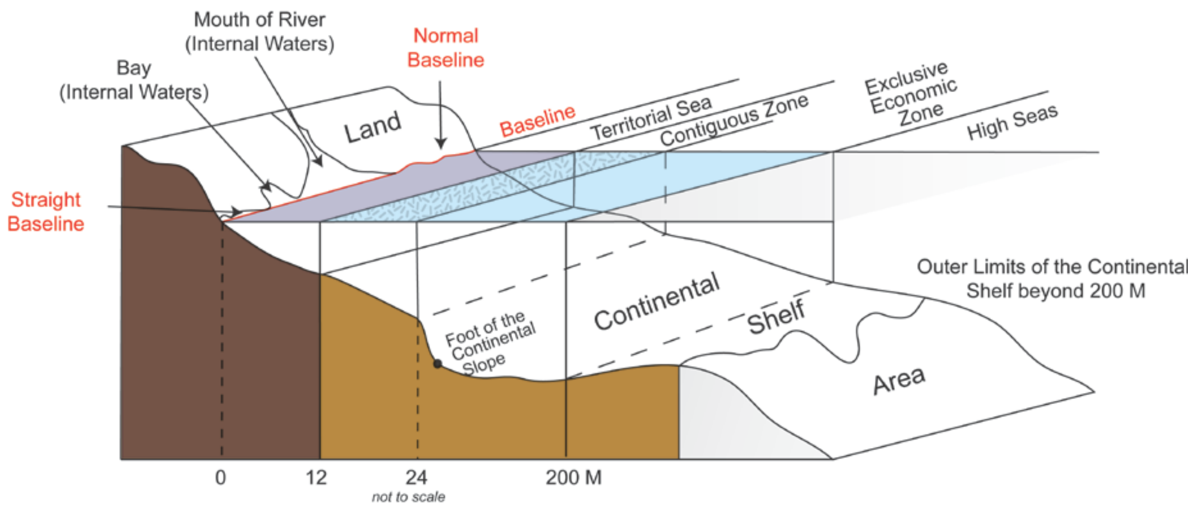

Figure 2: Maritime zones under UNCLOS[6] *Source: DOALOS*

15. In light of the fact that not all States have declared an EEZ and that the process to delineate the outer limits of the continental shelves extending beyond 200 nautical miles pursuant to article 76 of UNCLOS is still on-going, it is still difficult to ascertain the respective extent of areas within and areas beyond national jurisdiction.

16. It is estimated, however, that areas beyond national jurisdiction would cover approximately 230 million square kilometres – about 45 per cent of the surface of the planet. The significance of these areas is greater than this percentage would suggest: the waters and seabed beyond the limits of national jurisdiction are very deep, and therefore represent around 95 per cent of the space occupied by life on Earth in all its forms *(Chapter 36F).*

3. <u>State of marine biodiversity of areas beyond national jurisdiction</u>

Global overview

17. The patterns of marine biodiversity are shaped by variations in the depth and nature of the seabed, by variations in temperature, salinity, nutrients and currents of the water column, and by the latitudinal and seasonal variations in sunlight. The size and complexity of the ocean means that patterns in global biodiversity are largely unquantified, and their natural drivers not fully understood.

18. Two contrasting messages emerge about the ocean in general:

(a) An immense amount remains to be learned about the ocean's biodiversity, especially in areas beyond national jurisdiction;

[6] Training Manual for delineation of the outer limits of the continental shelf beyond 200 nautical miles and for preparation of submissions to the Commission on the Limits of the Continental Shelf, United Nations, New York 2006.

(b) Nevertheless, research so far shows how the ocean has changed in recent decades and centuries. It also reveals likely future trends and indicates management options likely to be more sustainable. Uncertainties, however, remain and surprises will be encountered *(Chapter 33)*.

Biodiversity of the watercolumn

Surface-water biodiversity

19. Down to about 200 metres, the depth to which sunlight can penetrate, the surface waters (the EPIPELAGIC zone shown in Figure 1) are of great biodiversity importance: they provide a substantial proportion of the world's primary production and thus of the basis for the removal of carbon dioxide from the atmosphere; they are where many fish species are found which support important fisheries; they constitute the routes by which highly migratory species traverse the globe; and they are home to a wide range of species *(Chapter 36 A-H)*.

Plankton

20. Primary production is the work of phytoplankton – (generally microscopic) photosynthetic plants and bacteria. Gross primary production (GPP) is the rate at which they use sunlight to convert carbon dioxide (CO_2) and water to the high-energy organic carbon compounds used to fuel growth. Free oxygen is released during the process. Net primary production (NPP) is GPP less the respiratory release of CO_2 by photosynthetic organisms. Globally, NPP on both land and sea is estimated to be about 105 billion tons[7] of carbon per year, about half of which is by marine algae and bacteria. Within the surface waters, phytoplankton account for about 94 per cent of that half. The remainder comes from seaweeds. Figure 3 shows the global distribution of estimated marine net primary production.

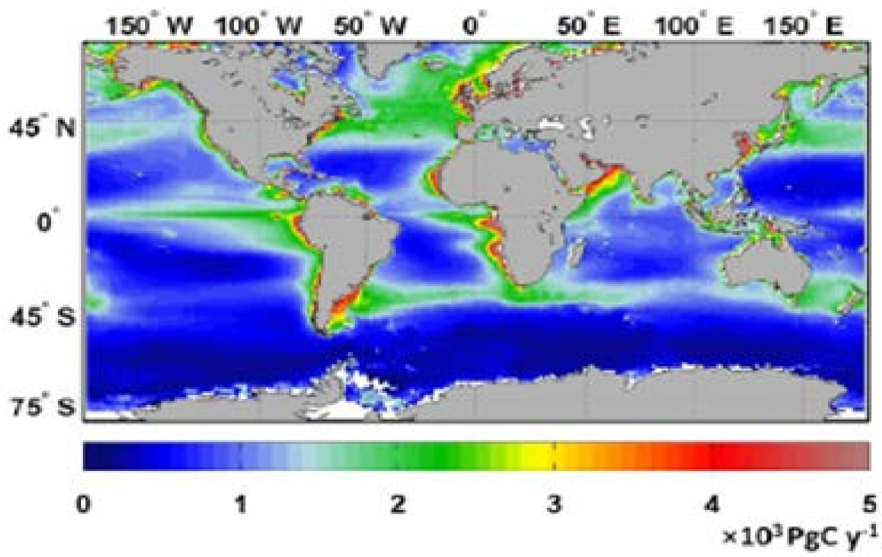

Figure 3: Estimated distribution of marine net primary production[8] *Source: Rousseaux, (1999)*

[7] "Ton" refers to the unit of 1,000 kilogrammes.

[8] Climatological map Distribution of annual marine NPP for (a) NASA Ocean Biogeochemical Model and (b) Vertically-Integrated Production Model (VGPM) for the period from September 1998 to 2011 (Rousseaux – August 1999 (Blue < 100 g C m^{-2}, Green > 110 g C m^{-2} and < 400 g C m^{-2}, Red > 400 g C m^{-2}) found in Rutgers Institute of Marine and Gregg, 2014.

21. As well as being an important component of the carbon cycle, phytoplankton provide food for higher trophic levels. The pattern of energy transfer from phytoplankton to higher trophic levels is determined by their size. In subtropical, nutrient-poor, warm waters, transfer of energy from small phytoplankton (< 2µm) to higher predators takes a larger number of steps and therefore provides a longer and lower flow of organic carbon. In contrast, in nutrient-rich, cooler waters, with larger phytoplankton (> 20 µm), the pathway is shorter and energy transfer is fast.

22. Found throughout the water column, microscopic and larger animals and juvenile stages of fish, crustaceans, molluscs and other BENTHIC animals which feed on the phytoplankton form the group known as zooplankton. Like phytoplankton, these all provide food for higher trophic levels and, in the case of the juvenile stages, will develop into those higher levels *(Chapter 6).*

23. Plankton of all kinds show an enormous range of biodiversity. A single litre of seawater can contain representatives of all major branches of the tree of life: Archaea, Bacteria and all major kingdoms of Eukaryotes *(Chapter 34)*.

Deep-sea biodiversity

General

24. We know much less about the deep sea, below about 200 metres depth, than about the coastal areas or the land. Much less than 0.0001 per cent of the over 1.3 billion km^3 has been explored. Even so, there is strong evidence that this region is highly rich and diverse in species.

25. In some regions, the species richness and diversity of deep-sea waters can be greater than that of surface waters. The biodiversity of deep-sea waters supports ecosystem processes necessary for the Earth's natural systems to function. Many of the theories to explain high biodiversity in the deep-sea emphasize the range of habitats and the slow time scales at which they operate.

26. The ecosystem processes crucial for global functioning include, for example, the breakdown in the deep-sea of organic matter into inorganic components (remineralization), which regenerates the nutrients that help fuel the ocean's primary production. Whilst coastal and shallow-water processes and functions produce services within relatively short time scales and on local and regional spatial scales, the deep-sea processes and ecosystem functions often translate into useful services only after centuries of continuous activity *(Chapter 36F)*.

27. Below the surface waters, the deep layer where sunlight penetrates with insufficient intensity to support primary production, is called the MESOPELAGIC zone. This zone is a particularly important habitat for the fauna controlling the depth of CO_2 sequestration.

28. Below the MESOPELAGIC zone, about 1,000 metres deep, is the largest layer of the deep-sea water column and by far the largest ecosystem on our planet **-** the BATHYPELAGIC region. This zone comprises almost 75 per cent of the volume of the ocean. Temperatures there are usually just a few degrees Celsius above zero.

29. The transitions between the various vertical layers are gradients, not fixed boundaries. Hence ecological distinctions among the zones are somewhat blurred across the transitions. The abundance and biomass of organisms generally varies among these layers from a maximum near the surface, decreasing through the lower layers, but increasing somewhat near the seabed. Although abundances are low, because this is such a huge volume, even species that are rarely encountered may have very large total populations.

30. The life cycles of deep-sea animals often involve shifts in vertical distribution as they mature. Even more spectacular are the daily vertical migrations of many MESOPELAGIC species, in order to feed in shallower waters at night. This vertical migration may increase physical mixing of the ocean water and contributes to a "biological pump" that drives the movement of carbon compounds and nutrients from the surface waters into the deep sea. Their and other species' biomass (abundance) is unknown. Studies of

microbes and their roles in the deep pelagic ecosystems are only just beginning to reveal the great diversity of such organisms.

31. The nekton (the organisms that swim independently through the ocean), include many species of fish, crustaceans (such as krill), and cephalopods (such as squids). Deep-sea fishes globally outnumber those in other parts of the ocean in terms of abundance and constitute the overwhelming majority of fish biomass on Earth. Within these, fishes of the MESOPELAGIC zone constitute a major component of the global carbon cycle. The bristlefish (genus *Cyclothone*) alone are more abundant than all coastal fishes combined, and are likely to be the most abundant vertebrates on Earth. Nektonic species in the deep sea are a key source of prey for many ocean predators, including whales, seals, fish, sharks and some seabirds and sea turtles, with overall consumption by predators considered as highly significant in terms of biomass *(Chapter 6 and 36F)*.

Biodiversity of the seabed

32. Generally, the great depth of areas beyond national jurisdiction has made surveys of the seabed beyond the continental rise virtually impossible until the last few decades. We therefore know little about it. In the seabed of the deep-sea, which is mostly the abyssal plain, there are trenches (the hadal zone), mid-ocean ridges and seamounts. The hadal zone covers less than 1 per cent (about 3.4 million km2) of total ocean area. There are over 80 separate basins or depressions in the sea floor. There are 7 great trenches (>6,500 m -10,000 m deep) around the margins of the Pacific Ocean. The Atlantic contains the Puerto Rico trench (>6,500 m deep).

33. What is known about the seabed life (BENTHOS) of the areas beyond national jurisdiction of the main ocean basins[9] can be summarized as follows:

(a) There is a decrease in biomass and abundance of species with increasing depth;

(b) Body size generally decreases with depth, with the exception of scavengers, which have the opposite trend;

(c) At both the ABYSSAL and HADAL levels, crustaceans, bivalves and polychaetes (ringed worms) are the most important in terms of both abundance and diversity; among the larger animals, echinoderms are most important;

(d) Many of the benthic species of larger sizes are free-floating (plankton) in early life *(Chapter 36A – H).*

Hydrothermal vents and cold seeps

34. Hydrothermal vents and cold seeps are types of habitat where much knowledge has recently been gained. These have all been discovered within the last 40 years. These communities are energy hotspots located on the seafloor (including in HADAL zones and on mid-ocean ridges). They sustain some of the most unusual ecosystems on Earth, many of which occur in areas beyond national jurisdiction. These environments share high concentrations of the chemicals that drive primary production by chemosynthetic microbes, and their biota therefore are not directly reliant on photosynthesis from sunlight. Sediment-hosted seeps occur, in areas beyond national jurisdiction, in subduction zones, where they are often supported by subsurface hydrocarbon reservoirs. Both vent and seep ecosystems are made up of a mosaic of habitats covering wide ranges of conditions *(Chapter 45)*.

Mid-ocean ridges

35. The Mid-Ocean Ridge system is a continuous single feature on the earth's surface extending about 50,000 km around the planet; it defines the axis along which new oceanic crust is generated at tectonic plate boundaries. The ridge seabed is elevated above the surrounding ABYSSAL plains, reaching the sea

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[9] The Arctic Ocean, the Atlantic Ocean, the Indian Ocean and the Pacific Ocean.

surface at mid-ocean islands. The global ridge system represents a vast area of mid-ocean habitat at BATHYAL depths. The dominant fauna on the mid-ocean ridges is made up of BATHYAL species known from adjacent continental margins. However, new species, potentially found only on mid-ocean ridges, have been discovered. Further exploration will almost certainly increase the numbers of species found *(Chapter 36F).*

Marine species and habitats found in areas beyond national jurisdiction[10]

Corals (both cold-water, and tropical and sub-tropical)

36. Most coral formations in tropical and sub-tropical waters are associated with islands and continental coasts. They are therefore within areas of national jurisdiction. Some tropical and sub-tropical coral formations, however, are on seamounts and reefs that do not rise sufficiently above sea-level to form land. Some of these are in areas beyond national jurisdiction. These distant coral formations, most frequent in the Pacific, share the same features as the more numerous formations within national jurisdiction, and are subject to the same pressures.

37. These distant coral formations are important both for their biodiversity and for their role as breeding and nursery areas for many species. Their species complexity forms part of the overall biodiversity of coral reefs, which host 32 of the 34 recognised phyla of animals and approximately one-quarter of all marine biodiversity. The threats to such corals are also largely parallel to those for the near-shore coral formations: ocean warming and the consequent bleaching; acidification; and changes in the pattern of tropical storms; overfishing, trawler damage; and invasive species *(Chapter 43).*

38. Cold-water corals have been known for a couple of centuries, but it is only very recently that the extent of their occurrence has been appreciated. They cover a wide range of depths (39 m – 2,000 m and more) and latitudes (70°N – 60°S). Many are found below 200 metres, the average depth below which photosynthesis does not occur. Because of their association with deeper water, cold-water corals are often found beyond areas of national jurisdiction. The nearer they are to the poles, the shallower is the water they are likely to be found in. Cold-water coral structures support communities that are highly diverse by orders of magnitude above the surrounding seafloor. They can also serve as important spawning, nursery, breeding and feeding areas for a multitude of fishes and invertebrates, and as habitats for daily vertical migrators (*Chapter 42*).

Fish

39. World Ocean Assessment I aimed to avoid duplicating work already being done by the Food and Agriculture Organization (FAO) and did not therefore examine specifically fisheries in areas beyond national jurisdiction. A comprehensive survey of high seas fish stocks can be found in the recent report of the United Nations Secretary-General which, inter alia, includes input from FAO.[11] Nevertheless, the fish in areas beyond national jurisdiction that are economically most important are the tunas, billfishes, and the sharks and rays, all of which were studied in World Ocean Assessment I, which also considered other fish.

Tunas and billfishes

40. Tunas and billfishes live primarily in the upper 200 metres of the ocean and are widely distributed throughout the tropical, subtropical and temperate waters of the world's oceans. Seven of the 15 species of tuna or tuna-like species are commonly known as "principal market tunas" due to their economic importance in the global markets. Other tuna species have in general more coastal distributions, except for the slender tuna (*Allothunnus fallai*), which ranges widely. Billfish (e.g., marlin, swordfish) have a similarly wide distribution. The International Union for the Conservation of Nature classed nine species

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[10] These marine species and habitats were discussed separately in Part VIB of World Ocean Assessment I.

[11] Report of the Secretary-General to the resumed Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (also known as the 1995 United Nations Fish Stocks Agreement) (A/CONF.2010/2016/15) (http://www.un.org/Depts/los/2016_FAO_Overview.pdf)

of tuna and billfish as threatened or near-threatened on the basis of population trajectories independent of current management actions; data was lacking to assess four species *(Chapter 41).* Figure 4 shows the global aggregated temporal trends of catches by oceans of tuna and billfish species.

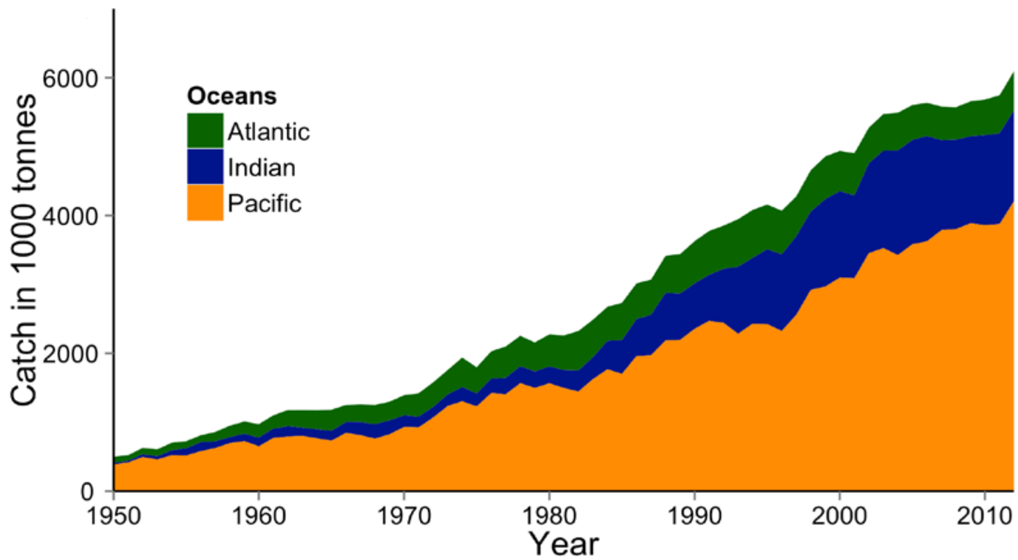

Figure 4: Global catch trends of tuna and billfish species: global aggregated temporal trends of catches by oceans *(FAO, 2014)*

Sharks and rays

41. Most sharks and rays are characterized as having low productivity associated with low fecundity, a slow growth rate, and a late age at sexual maturation. These life history characteristics are more similar to marine mammals than to the more productive bony fishes, which make them particularly susceptible to fishing pressure. Oceanic sharks appear to be particularly susceptible, due to their very low productivity *(Chapter 42).*

Deep-sea fish

42. Deep-sea fish species were the basis of major commercial fisheries in the 1970s to early 2000s, but started to decline as aggregations were fished out, and realization grew about the low productivity (and hence low yields) of these species and the impacts of some of these fisheries on seabed species. Globally the main commercial deep-sea fish species at present number about 20. Examples are orange roughy (*Hoplostethus atlanticus*) and armourhead (*Pentaceros richardsoni*). The current commercial catch of these main deep-sea species is about 150,000 tons, and has been similar over the period of 2011-2015. In some areas, for example the South Atlantic, fisheries on some seamounts have been closed for a number of reasons,[12] including in order to respect their status as Vulnerable Marine Ecosystems under the FAO Guidelines[13] *(Chapters 36B and 36H).*

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[12] The General Assembly in its resolutions 64/72 and 66/68 called for actions to address the impacts of bottom fishing on vulnerable marine ecosystems and the long-term sustainability of deep-sea fish stocks. These actions were most recently reviewed by the General Assembly in 2016 in its resolution 71/123.

[13] FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas.

Macroalgae (seaweeds)

43. Seaweeds that are anchored to the seabed are not usually found in areas beyond national jurisdiction, since the majority need to be in water less than 200 metres deep in order to capture sunlight. There are, however, some free-floating seaweeds which are found in areas beyond national jurisdiction. Of these the *Sargassum* species, which are the only genus to spend their whole life cycle floating, are probably the most significant *(Chapter 14).*

44. The Sargasso Sea has a distinct pelagic ecosystem based upon two species of *Sargassum*, and hosts a rich and diverse community, including ten endemic species. The Sargasso Sea is the only known spawning area for both the European and American eels (*Anguilla anguilla, A. rostrata*). Some shark species (including porbeagle sharks (*Lamna nasus*)) appear to migrate to the Sargasso Sea for breeding. *Sargassum* growing in the north equatorial recirculation region (NERR) between the north equatorial current and the equator has been washing up on beaches in many Caribbean areas, the coast of Brazil and even the coast of West Africa. This growth in areas beyond national jurisdiction is affecting local tourism *(Chapter 50)*.

Marine mammals

Large whales

45. By the late 19th century intensive whaling had caused severe depletion, and even near-extinction, of some species and populations of whales. Industrial mechanized whaling in the 20th century led to further major declines. Some populations of large whales have been recovering in recent decades: for example, humpback whales globally, blue whales in some regions and southern hemisphere right whales when treated as a single group. At the same time, many populations have failed to recover to anywhere near their original abundance. For example, right whales are effectively extirpated from the eastern North Atlantic, and are only barely surviving in the eastern North Pacific, the eastern South Pacific and around New Zealand *(Chapter 37).*

Pelagic dolphins

46. Pelagic (off-shore) dolphins are generally less susceptible to human interactions than many other cetaceans because they are relatively small, of little commercial importance, wide-ranging and live far from most human activities. There are clear interactions between offshore species and fisheries, particularly in the eastern tropical Pacific where they have symbiotic relationships with other pelagic animals of commercial interest. There is also direct harvesting when such species move into areas of national jurisdiction *(Chapter 37).*

Seals and fur seals

47. Although many species of seal and fur seal breed on land and spend considerable amounts of time foraging on the continental shelf, a number of species, particularly in the Southern Hemisphere, spend substantial periods in areas beyond national jurisdiction. Many populations are recovering from past exploitation, with recovery rates varying across populations and regions. Some populations are decreasing, with a number of populations and species considered threatened or near-threatened. Others are now stable after increases through the 1980s-2000s. The crabeater seal (*Lobodon carcinophaga),* the most abundant marine mammal in the world, is a pack-ice inhabitant feeding mostly on krill. In the Southern Ocean, predators frequent oceanic fronts, where they find favourable feeding conditions. These fronts are critical for the distribution of these marine mammals (*Chapters 36B, 36C, 36D, 36G, 36H).*

Polar bears

48. Polar bears are endemic to high latitudes of the northern hemisphere. They have a circumpolar distribution and depend on both sea ice (including sea ice in areas beyond national jurisdiction) and land for their living. Most populations have been severely depleted due to extensive hunting. The main current long-term and range-wide threat to polar bears is the projected loss of sea ice habitat associated with climate change. However, high levels of contaminants have been associated in polar bears with negative health effects in various polar areas *(Chapter 37).*

Marine reptiles

49. The marine reptiles that are found in areas beyond national jurisdiction are the marine turtles. Although marine turtles lay their eggs which hatch on beaches, and spend much of their time foraging in near-coastal waters, several species engage in long-distance seasonal migrations: loggerhead turtles (*Caretta caretta*), green turtles (*Chelonia mydas*); hawksbill turtles (*Eretmochelys imbricata*); and olive ridley turtles (*Lepidochelys olivacea*). These species are all regarded by the International Union for the Conservation of Nature as vulnerable (olive ridley), endangered (loggerhead and green); and critically endangered (hawksbill). The pressures come mainly from fisheries (although it is the coastal fisheries that have the greatest impact), coastal development (especially development of beaches for tourism) and egg harvesting *(Chapter 39).*

Seabirds

50. Overall, seabirds are more threatened, and their state has deteriorated faster, than most other comparable groups of birds. Seabirds face threats on land when breeding, and at sea when migrating and foraging. Pelagic species such as albatrosses and petrels are more threatened and have deteriorated faster than coastal species. Many species have vast ranges, straddling areas of national jurisdiction and areas beyond national jurisdiction, bringing them into contact with multiple fishing fleets – a key threat. Incidental by-catch in fisheries continues to drive much of the decreases in albatrosses and petrels, despite some action having been taken by fisheries management in many areas *(Chapter 38).*

Seamounts

51. Seamounts are predominantly submerged volcanoes, mostly extinct, rising hundreds to thousands of metres above the surrounding seafloor. Some also rise through tectonic uplift. Estimates of their numbers that rise 1,000 metres above sea-floor range up to more than 100,000 globally. At least half are in the Pacific, with progressively fewer in the Atlantic, Indian and Arctic Oceans. Seamounts can influence local ocean circulation, often bringing a sufficient flow of organic matter to support suspension-feeding organisms, such as corals and sponges. Depending on depth and ocean current regime, the seamount benthos may be dominated by an invertebrate fauna typical of the surrounding sediment-covered slope or abyssal plain or a more specialized fauna adapted to a high-energy, hard substrate-dominated deep-water environment. Seamounts that rise to MESOPELAGIC depths or shallower (< ~1,000 m) often have an associated fish fauna adapted to feed on the elevated flux of zooplankton, as well as vertical migrators intercepted by the seamounts during their downward daily migrations. More than 70 fish taxa have been commercially exploited around seamounts. Pressures on these habitats have been from fisheries and in future some are likely to be targeted for deep-sea mining in the future. In addition, there are probable cumulative impacts from climate change *(Chapter 51).*

4. <u>Benefits from marine biodiversity of areas beyond national jurisdiction</u>

Food from the sea

52. Seafood products, including finfish, invertebrates and seaweeds, are a major component of food security around the world. Overall, they provide 17 per cent of animal protein to the world population and provide more than 20 per cent of animal protein to over 3 billion people. Fisheries in areas beyond national jurisdiction are large-scale commercial fisheries. Although these provide significant contributions to global catches, particularly those targeting tuna and billfish, sharks and deep-sea fish stocks, they do not contribute to the major role played by small-scale (artisanal) fisheries in providing food in developing countries. Significant growth in marine capture fisheries (both within and beyond national jurisdiction) has occurred over recent decades in the eastern Indian Ocean, the eastern central Atlantic and the northwest, western central and eastern Pacific. Overfishing, including illegal, unregulated and unreported catches of some fish stocks, is reducing the yield realized from those stocks. Furthermore, most fisheries for deep-water species have outpaced the ability to provide scientific information and to implement effective management. Regional fisheries management organizations are increasingly adopting

conservation and management measures regarding fisheries to specifically address sustainability challenges in areas beyond national jurisdiction *(Chapters 10, 11, 15 and 41).*

Marine genetic resources

53. The study and utilization of marine genetic resources (MGRs) are fairly recent activities. The MGRs can be drawn from all levels of biota in the ocean, from bacteria to fish. MGRs have potential importance to the economics and sustainability of many sectors, including the pharmaceutical industry (new medicines), cosmetics, the emerging nutraceutical industry, aquaculture (new high-value high nutrition, healthy foods) and biomedicine. Generally, a decline has been noted since the mid-1990s in the interest of large pharmaceutical companies in the development of "drugs from the sea", probably related to a general decline in all-natural product research. Some hints of a recent resurgence exist, but it will be several years before it can be seen whether this will continue. New and affordable developments in analytical technologies (gene-sequencing, biomolecule characterization) have helped drive this new trend. There has also been growth over the past decade in the accumulation of patent claims related to marine organism genes (currently increasing by 12 per cent per year) and identified marine natural products. As of 2011, 70 per cent of these claims originated in three countries (Germany, Japan and the United States). In a different context, it is not only medical and pharmaceutical products that can be derived from MGRs. For example, marine algae are an important source of novel antifouling compounds and there are possibilities for marine glues. Little is known about the extent of these activities in areas beyond national jurisdiction, but an example exists from a Sargasso Sea study *(Chapter 29).*

Other benefits related to marine biodiversity of areas beyond national jurisdiction

Cultural aspects of the ocean

54. The ocean in areas beyond national jurisdiction is so far from human settlements that there is little cultural interaction between the biodiversity of those parts of the ocean and humans. Nevertheless, there are several aspects of significance, for example:

(a) There is the cultural heritage of the Polynesians and Melanesians in navigating long distances across the ocean, using only observation of stars, wildlife and sea condition;

(b) There is the role of whales and other marine mammals, as part of the cultural heritage of many parts of the world (for example, the Innuit, first nations and native Americans in North-West America, the Færoes and other parts of Scandinavia, and Indonesia and Japan);

(c) Underwater historical and archaeological sites (including shipwrecks and their natural context) in areas beyond national jurisdiction form part of the world's underwater cultural heritage *(Chapter 8).*

Knowledge from marine scientific research

55. Obtaining sustainable benefits from the marine environment of areas beyond national jurisdiction requires sound scientific knowledge of the physical, chemical and biological status of those areas, their ecosystem functions and their resilience to natural change and human impacts. Observation in areas beyond national jurisdiction to monitor deep-sea ecosystems, their biodiversity structure and functioning and the environmental changes that will affect them is therefore necessary. One of the major goals of deep-sea observation initiatives is to better understand and predict the effects of climate change on the linked ocean-atmosphere system, and on marine ecosystems, biodiversity and community structure. A new initiative involves the integration of submarine cables into a real-time global climate and disaster monitoring system, including re-use of out-of-service cables *(Chapters 19 and 30).*

Access to benefits

56. The distribution around the world of the benefits drawn from the ocean is in general still very uneven. Gaps in capacity-building hamper less developed countries in taking advantage of what the ocean can offer them. Sustainable use also requires capability to address the factors that degrade the ocean. In respect of benefits currently being drawn from the biodiversity of areas beyond national jurisdiction, this

situation is reflected in the way in which the most significant benefit (food from the sea) is captured mainly by large-scale, commercial fishing fleets. Such fleets in general require a major economy to support them. The same is likely to be the case in respect of benefits from other developments such as the use of MGRs *(Summary – Theme H, chapters 11 and 29)*.

5. General changes/pressures affecting the ocean beyond areas of national jurisdiction

57. Major features of the ocean are changing significantly as a result of climate change and related changes in the atmosphere. World Ocean Assessment I draws heavily on the work of the Intergovernmental Panel on Climate Change within the framework of the United Nations Framework Convention on Climate Change for material related to climate change.

Sea temperature

58. The Intergovernmental Panel on Climate Change has reaffirmed in its fifth report its conclusion that global sea-surface temperatures have increased since the late nineteenth century. Upper-ocean temperature (and hence its heat content) varies over multiple time scales, including seasonal, inter-annual (for example, those associated with the El Niño-Southern Oscillation), decadal and centennial periods. Depth-averaged ocean-temperature trends from 1971 to 2010 show warming over most of the globe. The warming is more prominent in the northern hemisphere, especially in the North Atlantic. Zonally averaged upper-ocean temperature trends show warming at nearly all latitudes and depths. However, the greater volume of the ocean in the southern hemisphere increases the contribution of its warming to the global heat content.

59. The ocean's large mass and high heat capacity enable it to store huge amounts of energy, more than 1,000 times than that found in the atmosphere for an equivalent increase in temperature. The earth is absorbing more heat than it is emitting back into space, and nearly all that excess heat is entering the ocean and being stored there. The ocean has absorbed about 93 per cent of the combined extra heat stored by warmed air, sea, land, and melted ice between 1971 and 2010. The consequent warming is resulting in an increasingly poleward distribution of many marine species and in extreme climatic events that cause coral bleaching *(Chapters 5 and 43)*.

Sea-level rise

60. It is very likely that extreme sea-level maxima have already increased globally since the 1970s, mainly as a result of global mean sea-level rise. That rise is due in part to warming, causing ocean thermal expansion and the melting of glaciers and of the polar continental ice sheets. Globally averaged sea-level has thus risen by 3.2 mm a year for the past two decades, of which about a third is derived from thermal expansion. Some of the remainder is due to fluxes of freshwater from the continents, which have increased as a result of the melting of continental glaciers and ice sheets.

61. Changes in sea-level in areas beyond national jurisdiction are mainly of importance for seamounts and associated coral formations, since such changes will affect their relation to the surface of the water *(Chapter 5).*

Ocean acidification

62. Rising concentrations of carbon dioxide in the atmosphere are resulting in increased uptake of that gas by the ocean. There is no doubt that the ocean is absorbing more and more of it: about 26 per cent of the increasing emissions of carbon dioxide is absorbed by the ocean, where it reacts with seawater to form carbonic acid. When carbon dioxide is absorbed by seawater, a series of chemical reactions occur that reduce seawater pH,[14] carbonate ion concentration, and saturation states of biologically important calcium carbonate minerals. The resulting acidification of the ocean is occurring at different rates around the seas,

[14] The pH scale is a measure whether a liquid is acid or basic (non-acid). The lower the pH, the more acid is the liquid.

but is generally decreasing the levels of calcium carbonate dissolved in seawater, thus lowering the availability of carbonate ions, which are needed for the formation by marine species of shells and skeletons *(Chapters 5 and 7)*.

Salinity

63. Alongside broad-scale ocean warming, shifts in ocean salinity (salt content) have also occurred. The variations in the salinity of the ocean around the world result from differences in the balance between freshwater inflows (from rivers and glacier and ice-cap melt), rainfall and evaporation, all of which are affected by climate change. The shifts in salinity suggest that, at the surface, high-salinity subtropical ocean regions and the entire Atlantic basin have become more saline, while low-salinity regions, such as the western Pacific and high-latitude regions have become even less saline *(Chapter 5)*.

Stratification

64. Differences in salinity and temperature among different bodies of seawater result in stratification, in which the seawater forms layers, with limited exchanges between them. Increases in the degree of stratification have been noted around the world, particularly in the North Pacific and, more generally, north of 40ºS. Increased stratification brings with it a decrease in vertical mixing, which impacts on the amount of nutrients brought up from the deep sea into the zone that sunlight penetrates, with consequent reductions in primary productivity *(Chapter 5).*

65. The warming of ocean water reduces oxygen solubility in the surface waters. At the same time, warming increases stratification, which reduces the transfer of oxygen to the deeper water. Together, these two effects cause a significant marine oxygen loss, termed "ocean deoxygenation". This loss is not uniform, and is most evident in the North Pacific and in subtropical and tropical oceans, particularly at intermediate depths (200 m -1,000 m). Much of this occurs in areas beyond national jurisdiction and affects biodiversity and the distributions of species, since it reduces the habitats available for groups of species that are intolerant of low levels of oxygen (e.g., some tuna and billfishes, and deep-sea fishes) *(Chapters 5 and 36F)*.

Ocean circulation

66. As a result of changes in the heating of different parts of the ocean, patterns of variation in heat distribution across the ocean (such as the El Niño-Southern Oscillation) are also changing. There is evidence that the global circulation through the open ocean is changing, with potential effects on species distribution and other possible consequences, for example in weather patterns *(Chapter 5).*

Changes in ocean productivity

67. In the open ocean, climate warming will increase ocean stratification in some broad areas, and reduce primary production or result in a shift in productivity to smaller species of phytoplankton (or cause both these effects). This has the effect of changing the efficiency of the transfer of energy to other parts of the food web, causing changes in the biology of major regions of the open ocean, such as the equatorial Pacific.

68. It has been projected that under some climate change scenarios that up to 60 per cent of the current biomass in the ocean could be affected, either positively or negatively, resulting in disruptions to many existing ecosystem services. For example, modelling studies of species with strong temperature preferences, such as skipjack and bluefin tuna, project major changes in range and/or decreases in productivity *(Chapter 5).*

Loss of sea ice in high latitudes

69. The high-latitude, ice-covered ecosystems host globally significant arrays of biodiversity, and the size and nature of those ecosystems make them critically important to the biological, chemical and physical balance of the biosphere. Biodiversity in those systems has developed remarkable adaptations to survive both extreme cold and highly variable climatic conditions.

70. Ice-algal communities are unique to the polar regions and play a particularly important role in system dynamics. The Arctic Ocean is relatively low in biological productivity, and ice algae are estimated to contribute more than 50 per cent of the primary production in the permanently ice-covered central Arctic. Sea ice loss is also occurring in the Southern Ocean. As sea ice cover reduces, ice-algal communities there will decline. Such decline will seriously affect krill (*Euphausia superba*), a keystone species in that area *(Chapters 36G and H and 46)*.

6. **<u>Specific pressures on marine biodiversity of areas beyond national jurisdiction arising from human activities</u>**

Fisheries

71. Fishing is the most significant specific pressure on pelagic biodiversity in areas beyond national jurisdiction. Capture fisheries affect marine ecosystems through a number of different mechanisms, for example:

(a) Heavy fishing can reduce the size of targeted populations to unsustainable levels and can extirpate distinct local stocks.

(b) Fishing can artificially select for different body and reproductive traits, leading to populations and species composed of smaller, earlier-maturing individuals.

(c) Fishing can affect populations of non-target species as a result of by-catches or ghost fishing (the entanglement of animals in discarded fishing nets). Each year by-catch in longline fisheries is estimated to kill, for example, 160,000-320,000 seabirds from 70 species. Where management action has been taken, by-catch has been substantially reduced;

d) Fishing can affect predator-prey relationships, which can lead to shifts in community structure that do not revert to the original condition upon the cessation of fishing pressure (known as alternative stable states);

(e) Fishing can reduce habitat complexity and trawling can perturb seabed (BENTHIC) communities *(Chapters 11 and 38).*

Discharges and emissions of hazardous substances

72. Hazardous substances cover both heavy metals and persistent organic pollutants (POPs). Discharges of these substances from land to watercourses result in significant inputs to the marine environment, with harmful, or potentially harmful, effects on marine biota. Emissions of these substances to air also can result in harmful, or potentially harmful, inputs to the ocean. Transport from land through the atmosphere is the most significant for areas beyond national jurisdiction: hazardous substances can remain suspended for long periods, and thus travel long distances. Observations of the presence of heavy metals and other hazardous substances in such areas are very limited. What information is available is mainly concentrated on the north Atlantic. The Indian Ocean and the southern parts of the Atlantic and Pacific Oceans have hardly been assessed.

73. However, available evidence does not show that heavy metals in areas beyond national jurisdiction are at levels indentified as likely to cause adverse effects on humans or biota – with the exception of mercury. The load of mercury in the atmosphere has approximately tripled in the last two centuries. This has led to a probable doubling of inputs to the ocean. However, in some open ocean areas (such as near Bermuda), levels of mercury in the sea have decreased from the early 1970s to 2000. Nevertheless, some species concentrate mercury (including from natural sources) in their flesh to levels which give rise to risks for humans who consume large quantities of seafood. Mercury concentrations in deep-sea fishes are several times higher than in surface-water (EPIPELAGIC) fishes at the same trophic level. Some long-lived fishes on seamounts, such as orange roughy and black cardinalfish, have mercury levels approaching the levels usually regarded as unsafe for human consumption (about 0.5 ppm). Human

activities have also led to higher levels of airborne inputs of lead and cadmium, but in these cases there is no evidence yet of toxic effects.

74. For POPs, there is no doubt that they can be carried long distances through the atmosphere. However, information specifically on the levels of deposition of POPs in the open ocean, and their possible effects, is very limited. Estimates suggest that concentration of POPs may be an order of magnitude higher in deep-sea fishes than in surface-water fishes. The deep-sea has been referred to as the ultimate global sink for POPs *(Chapter 20).*

Terrestrial and coastal development

75. Seabirds and some marine reptiles and mammals breed on land or use coastal areas for breeding or nurseries, but range out into areas beyond national jurisdiction. Physical development or excessive visits by tourists can damage these breeding and nursery areas. Globally, there are many drivers for development in coastal areas; although little global information is available, regional data shows that the proportion of the area close to the shoreline covered with urban development has been growing rapidly. *(Chapters 26 and 27).*

Disposal of solid waste

76. In the past, solid waste was dumped in areas beyond national jurisdiction. Dumping of solid waste reported to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London Convention), and its 1996 Protocol is now exclusively within areas of national jurisdiction. Unfortunately, the proportion of States submitting reports has fallen to under 50 per cent of Contracting Parties. It is not clear whether this is because dumping is not taking place, or because it is simply not being reported.

77. In the 1950s and 1960s, some States with nuclear industries dumped low-level radioactive waste in areas beyond national jurisdiction. All dumping of radioactive waste is now prohibited under the London Convention and Protocol. Monitoring of historic dumping of radioactive waste has not shown any adverse effects *(Chapter 24).*

Marine debris

78. Marine debris is present in all marine habitats. It has been estimated that the average density of marine debris varies between 13,000 and 18,000 pieces per square kilometre. However, data on plastic accumulation in the North Atlantic and Caribbean from 1986 to 2008 showed that the highest concentrations (more than 200,000 pieces per square kilometre) occurred in areas beyond national jurisdiction – the convergence zones between two or more ocean currents. Computer modelling confirms that debris will be transported by ocean currents and will tend to accumulate in a limited number of subtropical convergence zones or gyres, located in areas beyond national jurisdiction.

79. Plastics are by far the most prevalent debris item recorded, contributing an estimated 60 to 80 per cent of all marine debris. Some pieces are large – they can be measured in metres, and can cause problems such as entanglement. However, plastic microparticles (up to 5 mm in size) and even smaller nanoparticles (up to one millionth of a millimetre) are of increasing concern. The density of plastic microparticles within the North Pacific Central Gyre has increased by two orders of magnitude in the past four decades. The majority of marine debris entering the sea (approximately 80 per cent) is considered to originate from land-based sources *(Chapter 25).*

80. Nanoparticles come from various sources: from the use of nanoparticles in various industrial processes and cosmetics, from the breakdown of marine debris, from fragments of artificial fabrics discharged in wastewater, and from leaching from land-based waste-disposal sites. Nanoparticles appear to reduce primary production and the uptake of food by zooplankton and filter-feeders. The scale of the threats from nanoparticles is unknown, and further research is required *(Chapter 6).*

Mineral exploitation

81. At present, exploitation of mineral resources (both hydrocarbons and other minerals) is entirely within areas of national jurisdiction. However, exploration for a wide range of metals is already under way in areas beyond national jurisdiction, and exploitation may soon start. Although commercial deep-sea mining has not yet commenced, the three main deep-sea mineral deposit types – sea-floor massive sulphides (SMS), polymetallic nodules and cobalt-rich crusts – have been the subject of interest for some time. The economic interest in SMS deposits is for their high concentrations of copper, zinc, gold, and silver; in polymetallic nodules for manganese, nickel, copper, molybdenum and rare earth elements; and in ferromanganese crusts for manganese, cobalt, nickel, rare earth elements, yttrium, molybdenum, tellurium, niobium, zirconium, and platinum.

82. The International Seabed Authority (ISA), which regulates deep-sea mining in the Area has entered into 15-year contracts for exploration for polymetallic nodules, SMS and cobalt-rich ferromanganese crusts in the deep seabed. Draft regulations on the exploitation of these mineral resources are being developed and an environmental management plan for the Clarion-Clipperton fracture zone was adopted in 2012. Further information on the current situation can be found on the ISA's website (www.isa.org.jm).

83. The decision to commence deep-sea mining in the Area will depend in part on the availability of metals from terrestrial sources and their prices in the world market, as well as technological and economic considerations based on capital and operating costs of the deep-sea mining system and costs of compliance with environmental requirements *(Chapter 23).*

84. Exploration for hydrocarbons in areas beyond national jurisdiction has not yet really started, but given the extension of hydrocarbon exploration into very deep water (>1,500 m), it is possible that in the future this activity will be extended beyond areas of national jurisdiction *(Chapter 22).*

Geo-engineered sequestration of carbon dioxide

85. Sequestration of carbon dioxide by stimulating primary production in the ocean has been discussed. There is thus the possibility of developments of this kind in areas beyond national jurisdiction. In 2008, a resolution was adopted which included ocean fertilization activities within the scope of the London Convention and its 1996 Protocol. This resolution states that permission should not be given for any such process except for legitimate scientific research *(Chapter 24).*

86. Another form of carbon dioxide sequestration is placing the gas into sub-seabed geological formations. The intention is to prevent release into the biosphere of substantial quantities of carbon dioxide derived from human activities, by retaining the carbon dioxide permanently within such geological formations. At present there seems to be no intention to use this process in areas beyond national jurisdiction.

Shipping

87. Discharges of oil, both as operational discharges and from maritime disasters, occur as ships navigate. These discharges are also found in areas beyond national jurisdiction. Over the last 40 years, great progress has been made both in reducing routine discharges and in avoiding maritime disasters. Concern remains about certain areas where heavily trafficked routes lead to concentrations of shipping. However, these are nearly all within areas of national jurisdiction. The one area beyond national jurisdiction where interactions between marine biota and ships' discharges of oil have been observed is the area to the south of the Cape of Good Hope.

88. By the early 1990s, it was becoming apparent that, in some parts of the world, emissions of greenhouse gases from ships were of concern. Estimates in 1997 of total global nitrogen oxide (NOx) emissions from shipping suggested that they were equivalent to 42 per cent of such emissions in North America and 74 per cent of those in European OECD countries. Much of these emissions took place in areas beyond national jurisdiction. In 1997 a new annex (Annex VI) to the International Convention for

the Prevention of Pollution from Ships (1973), as modified by the Protocol of 1978 relating thereto (MARPOL) was adopted to limit the main air pollutants contained in ships' exhausts, including NOx and sulphur oxides (SOx). Following its entry into force in 2005, it was revised in 2008 to reduce progressively up to 2020 global emissions of NOx, SOx and particulate matter, and to introduce emission control areas to reduce emissions of those air pollutants further in designated sea areas.

89. The other main impact of shipping on the marine environment in areas beyond national jurisdiction comes from the noise that ships generate. Shipping is the most widely distributed source of human-made noise in the marine environment and the main source in areas beyond national jurisdiction. Long-term measurements of ocean ambient sound indicate that low-frequency anthropogenic noise has been increased, primarily due to commercial shipping. A variety of marine animals are known to be affected by anthropogenic noise in the ocean *(Chapter 17)*.

Submarine cables and pipelines

90. In the last 25 years, submarine cables have become a dominant element in the world's economy: they carry 95 per cent of intercontinental, and a large proportion of other international, internet traffic. There are now about 1.3 million route kilometres of submarine cables, much of it in areas beyond national jurisdiction. The impacts are, however, very limited because of the small diameter of the cables and because, in water deeper than 1,500 metres, the cable is normally simply laid on the seabed. No significant disturbance of the marine environment has been noted. There are at present no pipelines in areas beyond national jurisdiction. It seems certain, however, that these will be needed when seabed mining starts. Leakages from such pipelines, as a result of breaks or natural disasters, could cause significant harm to the marine environment *(Chapter 19)*.

7. <u>Conclusion</u>

91. The greatest threat to the ocean comes from a failure to deal quickly with the manifold problems that have been described above. Many parts of the ocean, including some areas beyond national jurisdiction, have been seriously degraded. If the problems are not addressed, there is a major risk that they will combine to produce a destructive cycle of degradation in which the ocean can no longer provide many of the benefits that humans currently enjoy from it.