

Environmental, scientific and technological aspects

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1. The oceans are characterized by a high diversity of life, ecosystems and physical features, ranging from shallow, near-shore ecosystems and species to the deepest and remote features such as trenches and abyssal plains, both within and beyond areas of national jurisdiction. For a long time, the deep oceans were thought to be a desert in terms of species diversity. It was once believed that sources of productivity in these environments were limited to material sinking from above, since no other source of energy and carbon was known. In 1977, however, scientists on board of the submersible Alvin discovered sites near the Galapagos Islands where high-temperature fluids rich in reduced compounds pour out into the water column and which are host to unique seabed, or benthic, ecosystems. Later research led to the discovery of other benthic ecosystems characterized by energy sources other than light, such as sediment communities and seep communities. Other discoveries revealed a wealth of different benthic habitats and biodiversity hot spots in the deep oceans, including seamounts and cold and deep water corals. Pelagic environments, which are found in the water column, are also host to a wide range of micro- and macro-organisms.
2. While the specific role of some of these ecosystems is still little understood, it is generally recognized that marine ecosystems and biodiversity have critical functions in the natural cycle and in supporting life on Earth. Marine ecosystems and biodiversity, including beyond areas of national jurisdiction, also provide a source of livelihood to billions of people around the world.
3. Yet, as noted in the 2005 **Millennium Ecosystem Assessment**, oceans and coasts are among the most threatened ecosystems of the world. No marine area is unaffected by human activities and almost half of the areas are strongly affected by multiple drivers of change. Demand for seafood continues to grow as population increases. Wild fish stocks continue to come under pressure, and aquaculture expands further offshore. Some fishing practices such as illegal, unreported and unregulated fishing, over-fishing, by-catch, and the use of destructive gear in vulnerable marine ecosystems are also taking their toll on marine habitats and resources. Pollution from all sources, including shipping, the introduction of invasive alien species through ship ballast water, and anthropogenic underwater noise is also damaging. Climate change causes fish populations to redistribute towards the poles, and tropical oceans become comparatively less diverse. Ocean acidification weakens the ability of shellfish, corals and marine phytoplankton to form their skeletons, threatening to undermine marine food webs as well as reef structure. Hydrocarbon and mineral exploitation also threaten deep sea habitats and ecosystems. New uses of the oceans, such as climate change mitigation measures (e.g. iron fertilization and carbon sequestration) and the search for potentially valuable marine genetic resources, are also raising concerns.
4. Growing scientific and commercial interest in areas heretofore largely unexplored, along with the impacts of anthropogenic climate change and natural events, are cumulatively affecting marine biodiversity and biological resources, including beyond areas of national jurisdiction. These cumulative

especially those related to poverty, hunger and health, by increasing the vulnerability of the poor and reducing their options for development.

5. While the greatest intensity of human activities and pressures on marine biodiversity continue to be in coastal areas, a number of factors have spurred an increase in human activities further away from the coast. These factors include decline and, in some cases, collapse of shallow water fish stocks, the development of new technology to explore and exploit seabed resources, the search for new alternative sources of energy, and more stringent regulation of certain activities in areas within national jurisdiction. The **Centre for Maine Life** determined that fisheries, hydrocarbon, and mineral extraction have the greatest impacts in the deep sea. In the future, climate change is predicted to have the greatest effects. While an increasing amount of research is being carried out, much more still remains to be studied.

6. However, better scientific understanding of ocean threats is illustrating how isolated impacts from individual sectors concentrate, move beyond enclosed areas and seas and interact synergistically, affecting not only the local species and human communities that are dependent on coastal ecosystems, but increasingly the larger natural systems and human societies of which they form a part. Further information on these environmental aspects can be found in the relevant **Centre for Maine Life** (in particular A/60/63/Add.1, A/62/66/Add.2, A/64/66/Add.2 and A/66/70).

7. While the oceans cover two thirds of the planet, it is estimated that the vast majority thereof are yet to be explored. Access to marine ecosystems beyond areas of national jurisdiction, in particular to benthic and deep pelagic ecosystems, is dependent on highly specialized technology relating to vessels, equipment, techniques for sampling and analysis, appropriate infrastructure, highly trained personnel and adequate financial resources. Although marine technology has advanced considerably in recent years and new technologies are constantly being developed, thereby providing us with opportunities to increase our knowledge