The Wonder of the High Seas

The high seas include the international waters of the open ocean beyond any country’s exclusive economic zone (EEZ) and the ocean seabed that lies beyond the continental shelf of any country. This covers nearly half the surface of the Earth, 64% of the entire ocean, and includes 80% of our planet’s living space, or biosphere. Almost half of all marine waters are over 3,000m deep, and 60% of the world is covered by water more than 1,600m deep. Earth truly is the blue planet.

More people have journeyed to outer space than have ventured into the deep sea. These vast open-ocean and deep-sea environments are the least-explored areas on Earth, but are also among the most ecologically vital, critically threatened and least protected. A paltry 0.79% of the high seas is protected, compared with 12% of land areas, and there is no international organization or agreement in place to govern its use or conservation.

The ocean is the cornerstone of our entire life system, and yet we are neglecting and overexploiting it at a dangerous rate. Few people fully appreciate the value of the ocean – the majority of which is high seas – to our lives. It supplies the oxygen in every second breath we take; it drives our weather systems and regulates our climate; it provides essential nutrition; and we have only begun to explore the potential for marine species to contribute to life-giving medicines and other purposes. It is also becoming increasingly clear that the ocean is bearing the brunt of the effects of climate change. It has absorbed approximately 30% of the CO₂ and over 80% of the additional heat we have generated since the Industrial Revolution.

Rather than treasuring the ocean and the resources and services it provides, we have been treating it as a dumping ground and all-you-can-eat buffet. This cannot continue. The ocean is in decline and if we do not urgently address the causes – which all stem directly from human actions – the consequences will be severe.
What lies beneath?

The notion that the deep ocean is an uninhabited void – apart from the passing whale or shark – could not be further from the truth. In recent decades, marine scientists have revealed previously unimaginable biodiversity, and millions more species are still to be discovered. We now know that the vast majority of the ocean’s creatures live in, on, or just above the seabed, that there are more species of deep cold-water corals than their glamorous tropical counterparts, and that there are tens of thousands of seamount ranges playing host to an extraordinary variety of life, from whales and turtles to exotic sponges and alien-like organisms.

The cold, dark depths of the ocean are home to biodiversity richer than a tropical rainforest, the extent and potential of which we are barely beginning to grasp. Only 0.0001% of the deep seafloor has so far been the subject of biological investigation. We know more about the dark side of the Moon than we do about the deepest seas of our own planet.

The traditional image of the ocean teeming with fish is also being revised. The more familiar giants of the high seas – the marine mammals, sharks and other large fish – have massively decreased since the advent of motorised fishing and whaling. At its peak, in the 1960s, industrial whaling was killing 62,000 great whales every year, threatening all the species with extinction. Studies have shown that industrialized commercial fisheries typically reduce the biomass of the stocks they target by 80% within 15 years of exploitation. A study published in *Nature* in 2003 estimated that large predatory fish species have been reduced by 90% compared to pre-industrial levels. Whales may be a lot safer today than 50 years ago, but overfishing is still exacting a heavy cost on ocean biodiversity.

The condition of the stocks of the more than 200 species that are fished either solely or partially in the high seas areas is cause for particular concern. Analysis of available data by FAO indicates that about 30% of the stocks of highly migratory tuna and tuna-like species, more than 50% of highly migratory oceanic sharks, and over 65% of straddling stocks and other high seas fishery resources are either overexploited or depleted.

As these fish stocks become scarcer, fishing vessels are extending further and deeper into the high seas, using more powerful equipment to track and catch fish. This includes deep sea bottom trawling, the most destructive of all fishing types, which is threatening not only the vulnerable, slow-growing species it targets but also the vast expanses of the seabed that are irrevocably crushed by its giant nets and steel plates. Every year, 15 million km² of the ocean floor is damaged by bottom trawling. We are at risk of losing entire species and vital ecosystems before we even have a chance to study them.

Black coral (*Antipathella wollastoni*), a cold water coral that only possesses its spectacular appearance if underwater. In air, it progressively turns black while dying away. © Gavin Newman/GREENPEACE
Deeply hidden treasures

The high seas is a hugely rich and varied environment, encompassing vast abyssal plains, volcanoes, the highest and longest chain of mountains on Earth, deep trenches extending below 10,000m, sulphurous vents, and a huge volume of open water. The high seas are also the scene of the greatest migration on Earth, when each night billions of creatures emerge from the deep to feed in surface waters. In the other direction, some surface dwellers swim down to great depths in search of food, for example sperm whales dive to 2,000m to catch giant squid. Recent studies have found an Antarctic expressway where octopuses ride along in a flow of extra-salty water, and a ‘Shark Cafe’ in the Pacific where sharks gather in the thousands to feed in the winter. But among the richest of all ocean ecosystems in terms of biodiversity are seamounts and cold-water coral fields.

Breathtaking ranges of species have been found on the thousands of seamounts that exist around the world. Each new, unsampled mount is a source of enormous scientific potential, including thousands of species endemic to a particular area. As they create strong localised currents, accumulating huge quantities of plankton, seamounts attract huge numbers of marine species, from dolphins and whales, to spawning pelagic fish, to only recently discovered sponges and microorganisms.

Over two-thirds of all coral species live in deep, cold water, and can survive at very low temperatures. These cold-water corals include the oldest known living organisms, some of them at least 8,500 years old. They grow in huge, strangely shaped fields that can rise over 35m high, providing protection from currents and predators, spawning grounds, nurseries and food for hundreds of thousands of species.

These deep-water habitats are unique islands of biodiversity. They have existed undisturbed for centuries, and the mostly very slow-growing and late-maturing species that inhabit them are extremely vulnerable to human interference. As many species have been shown to be endemic to one location or region, they are exceptionally at risk of rapid extinction. It is not known how many species may already have been permanently extinguished by deep-sea fishing, which can now reach below 2,000m. The species specifically targeted by bottom trawling, such as orange roughy and grenadiers, are themselves highly unsuited to commercial fishing and stocks are rapidly wiped out. Left to their own devices, orange roughy can live 150 years; depleted stocks will take many, many decades to recuperate – if they ever do.

Careful scientific exploration, however, is already yielding exciting results, and the potential for new discovery is limitless. Deep-sea species such as corals and sponges are being investigated for their possible use in medicines that could help fight cancer, arthritis and other conditions. Some coral species can be used to produce antibiotics or contain pain-killing compounds. Other compounds found in some deep-sea sponges are believed to contain potent immunosuppressive and anti-cancer agents. Marine bioprospecting is a relatively new, and highly technical and costly, field; it is important that these resources are protected so that vital marine genetic diversity is not lost even before it can be found.

Hydromedusa (Calycopsis borchgrevinki), with extended tentacles, Weddell Sea, Antarctica. © Ingo Arndt / MINDEN / FLPA
Cycles of life

Even more fundamental than its provision of food and potential source of life-giving medicines are the planet-regulating services – and the ocean is at their heart. Chief among these is climate regulation. The vast open ocean plays a major role in the maintenance of the chemical composition of the atmosphere, which in turn determines our climate. Like a giant pump, the ocean draws carbon down from the surface layers and marine organisms act as a vast carbon sink, both in their own living tissue and by facilitating the burial of carbon in the seabed sediment. This natural carbon sequestration and storage process provides a climate regulation service for the planet, which is increasingly vital in the era of climate change.

Thermohaline circulation of ocean waters, driven by surface and deep-water currents, creates a worldwide system of currents called the ‘global conveyor belt’ which is essential for global nutrient and carbon cycles and is the basis of the world’s food chain. If this system was disrupted, for example by global environmental change, this would impact not only fisheries but also global weather patterns.

Climate change presents the biggest threat to the ocean. Since the Industrial Revolution, the ocean has become 26% more acidic, and acidification continues at levels unprecedented for millions of years; the surface layers of the ocean are currently warming at a rate of about 0.1°C per decade.

The high seas are not a remote, empty expanse; they are full of life, and they make our own lives possible. This last great global commons is neither as pristine nor as immune to human threats as was once believed. Our future and that of the ocean is intertwined. Respecting and protecting the high seas is one of the most pressing challenges of our time.

The ocean is in decline and if we do not urgently address the causes – which all stem directly from human actions – the consequences will be severe.