

Oceans

THE OCEANS cover 70 percent of the planet's surface and make up some 90 percent of space habitable by life forms. Most of their volume is far from land and locked deep beneath the surface, away from contact with the atmosphere. Less than a tenth of it has ever been explored; even so the human hand is increasingly evident.

Beyond the regional seas and the continental shelves lies the deep ocean – the most widespread natural habitat on the planet. Once dismissed as a marine desert, the deep ocean is now emerging as a center of vast biological richness. The seabed is peppered with “black smokers”, volcanic vents that are home to a huge variety of marine life. A fantastic range of invertebrates has been found occupying the sediment on the ocean floor¹.

Historically, fisheries have been the most abundant resource of the oceans. However, our over-exploitation is threatening some of the world's largest fish stocks. Such is the intensity of this assault that we may so reduce stocks that we will have to “farm” the bulk of our marine fish just as we do our livestock on land.

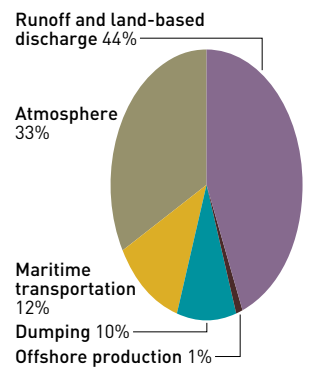
Other human activities are beginning to impinge on the ecological health of the vast expanse of oceans. Oil exploration is a major activity in such regions as the Gulf of Mexico, the South China Sea and the waters around the British Isles. The threats vary. There is growing evidence of widespread toxic effects on benthic communities on the floor of the North Sea in the vicinity of the 500-plus oil production platforms in British and Norwegian waters². Meanwhile, oil exploration in the deep waters of the North Atlantic, northwest of Scotland, threatens endangered deep-sea corals. There is evidence, too, that acoustic prospecting for hydrocarbons in these waters may deter or disorientate some marine mammals³.

In the future, the biological riches of the “black smokers” face threats from deep-sea mining. The mid-ocean hot springs spew out potentially valuable metal sulfides, such as gold, silver and copper. In the cold water, they are deposited in thick crusts, attracting exploitation. Rights have already been given to one company to prospect for metals on 4 000 square kilometers of the bed of the Bismarck Sea north of Papua New Guinea.

The oceans, like the atmosphere, are fundamental to the health of the planet. They dominate many of its cycling processes as well as being the ultimate sink for a variety of pollutants. They absorb about 2 billion tons of carbon – in the form of carbon dioxide (CO₂) – and disperse an estimated 3 million tons of oil spilt annually from ships and, predominantly, from sources on land.

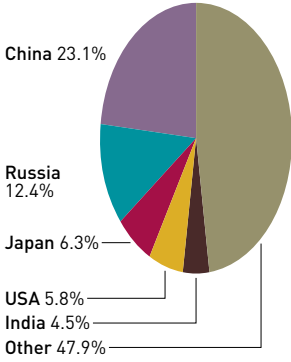
The oceans store a thousand times more heat than the atmosphere and transport enormous amounts of it around the globe. In consequence, they are largely responsible for determining climate on land. The warm Gulf Stream washing up from the tropics in the Atlantic Ocean keeps Europe many degrees warmer in winter than Hudson Bay on the opposite shore. The oscillation between El Niño and La Niña currents in the tropical Pacific Ocean fundamentally changes the weather across the ocean, flipping Indonesia, Australia and coastal South America into and out of

SOURCES OF POLLUTANTS FROM HUMAN ACTIVITIES ENTERING THE SEA



Source: UNEP.

FISHING VESSELS By ownership, 1995



Total: 24 million metric tons

Source: FAO.

OCEAN PRODUCTIVITY World marine catch, discards and fishery status, by fishing zone

Marine catch 1997, in metric tons

Catch includes marine fishes, crustaceans and molluscs.

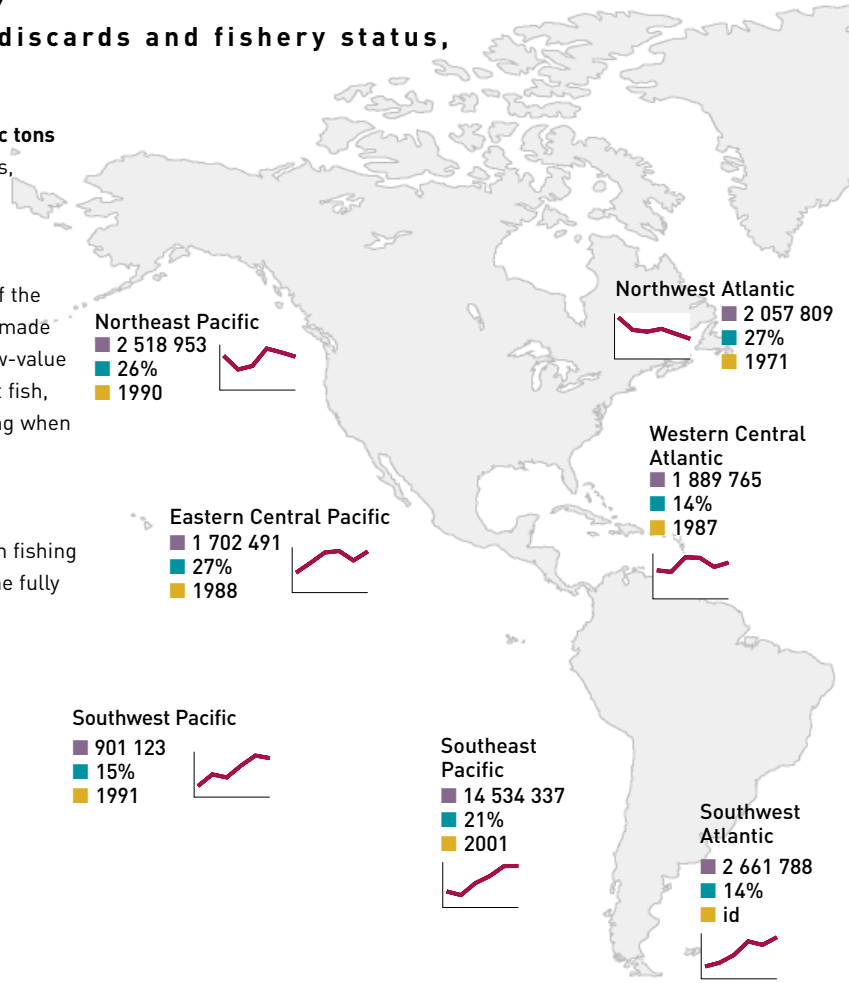
Marine bycatch

Estimate of the proportion of the overall marine catch that is made up of non-target species, low-value species or undersized target fish, presumed to be dead or dying when returned to the sea.

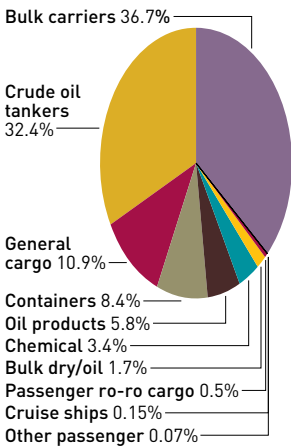
Fishery status

Estimate of the year in which fishing zones became or will become fully fished.

Trends in the marine catch, 1972-97



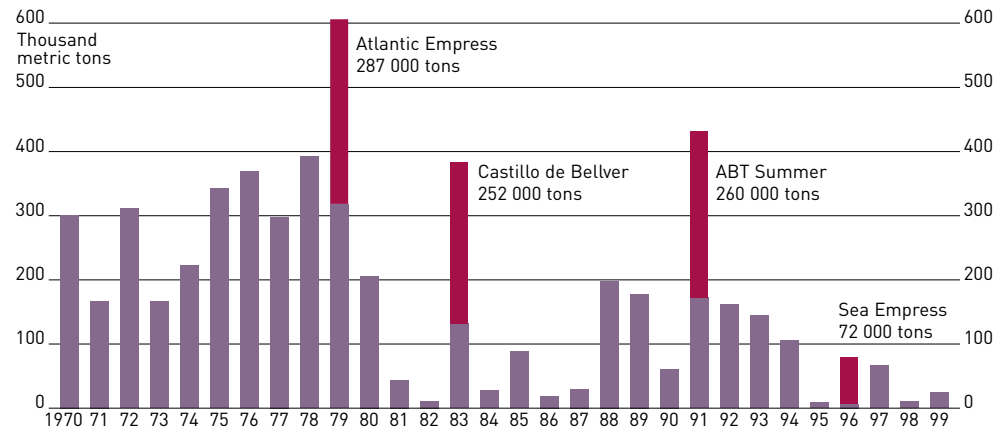
OCEAN TRAFFIC By type, 1998



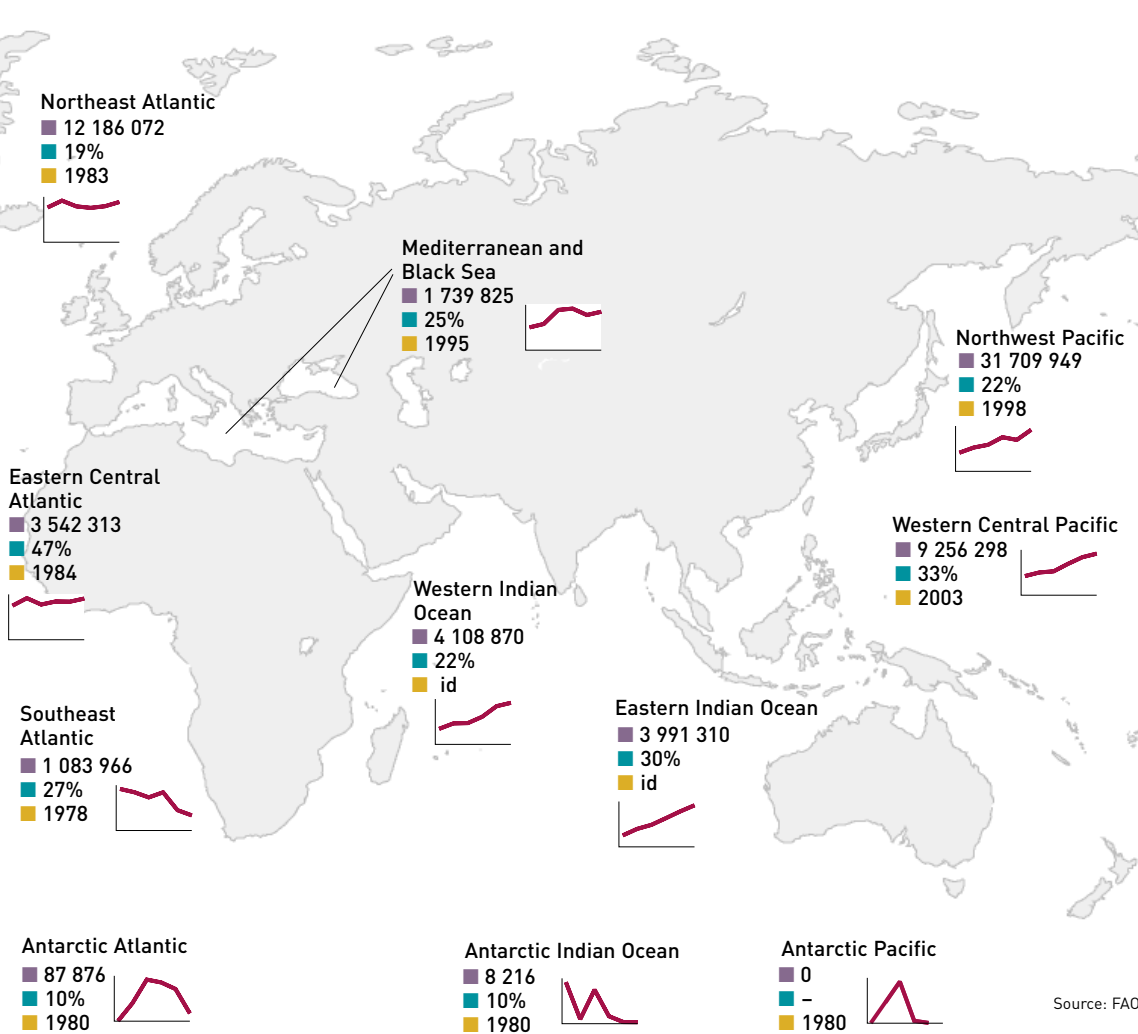
Total: 726.6 million deadweight metric tons

Source: Lloyds Register.

OIL TANKER SPILLS AT SEA, WITH SELECTED MAJOR SPILLS

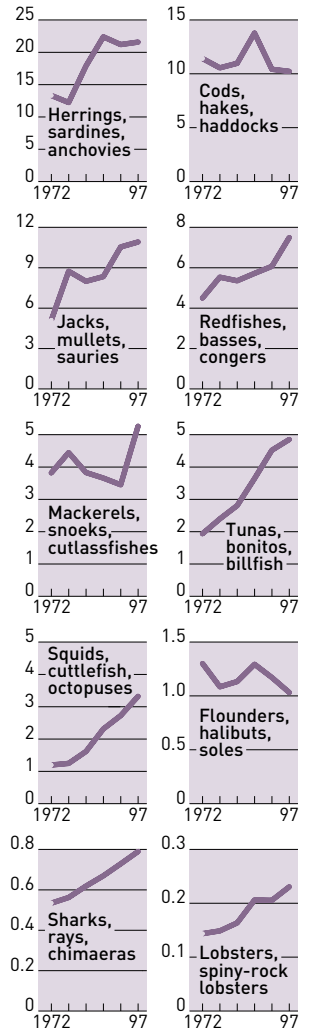


Source: ITOPF.

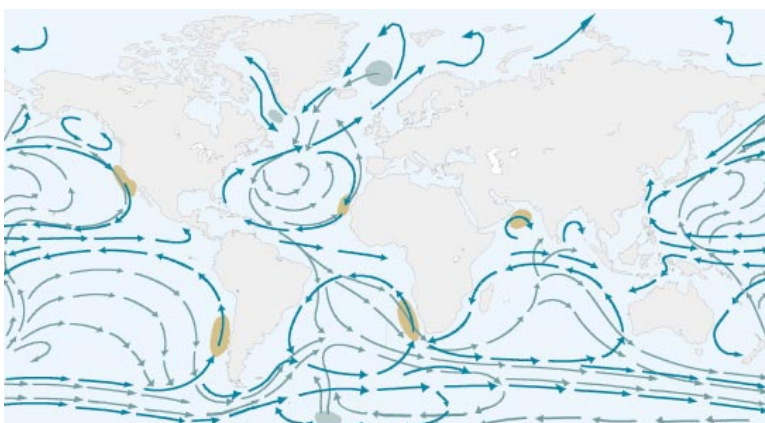


Source: FAO.

MARINE CATCH Fisheries (million metric tons)



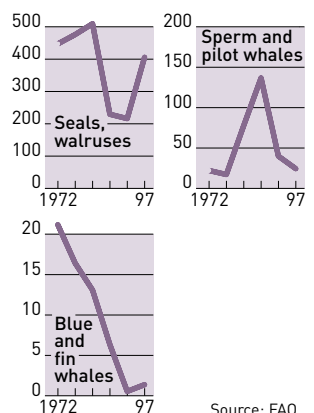
OCEAN CIRCULATION



- Surface currents
- Deep currents
- Source areas of cold bottom water
- Zones of upwelling

Source: UNEP-WCMC.

Mammals (thousands)



Source: FAO.

droughts and floods. All these processes now face disruption from the global scale of human activity, particularly climate change. Currently, the oceans moderate climate change by absorbing a third of the CO₂ emitted into the air by human activity. But several studies suggest that global warming will stratify the oceans and reduce their capacity to act as a CO₂ “sink” by 10 to 20 percent over the next century, accelerating warming⁴.

Global warming may already be triggering fundamental shifts in the ocean’s El Niño oscillation⁵. And if warming continues, climate modellers predict that freshwater from melting Arctic ice may form a cap on the salty waters of the North Atlantic. This could shut down the local plunging of dense, salty water to the ocean depths, which is one of the main engines of the global ocean circulation system known as the conveyor⁶. One effect would be to displace the Gulf Stream, resulting in considerably colder European winters.

There have been some successes in the international handling of the marine environment. The International Whaling Commission’s moratorium introduced in the mid-1980s, though not honored by all nations, has helped revive whale stocks. The United Nations Convention on the Law of the Sea, signed in 1982 but only entering into force in 1994, established a framework of law for the oceans, including rules for deep-sea mining and economic exclusion zones extending 200 nautical miles around nation states.

A series of international laws have effectively eliminated the discharge of toxic materials – from drums of radioactive waste to sewage sludge and air pollution from incinerator ships – into the waters around Europe. International public pressure in the mid-1990s forced the reversal by a major oil company of plans to scuttle the Brent Spar, a large structure from the North Sea offshore oil industry, into deep water west of Scotland. European agreements since then have indicated that all production platforms and other structures should be removed from the oil fields at the end of their lives wherever possible.

Efforts have also been made to safeguard marine fisheries. In 1993, more than a hundred nations signed a treaty promising to draw up regional agreements to protect international fish stocks. But progress has been slow, and the failure to reach effective common cause over protecting the planet’s fish stocks could arguably be one of the greatest failures of environmental diplomacy.

SEA-LEVEL RISE

One of the more predictable effects of global warming will be a rise in sea levels. It is already under way at a pace of about a millimeter a year – a consequence of both melting land ice and the thermal expansion of the oceans. Current predictions put the likely rise over the coming century at half a meter at the most⁷. But modelling studies suggest that once under way, thermal expansion will last for many centuries after warming of the atmosphere ceases. This is because it will take around a thousand years for the warming at the ocean surface to penetrate to the ocean depths. Even modest global warming over the next half century is likely eventually to raise global sea levels by between 1 and 2 meters – sufficient to drown many coastal areas and atoll islands – from thermal expansion alone⁸. Moreover, the IPCC predicts that a warming of 3°C would trigger the irreversible melting of the Greenland ice sheet, raising sea levels by 7 meters over a thousand years or more.