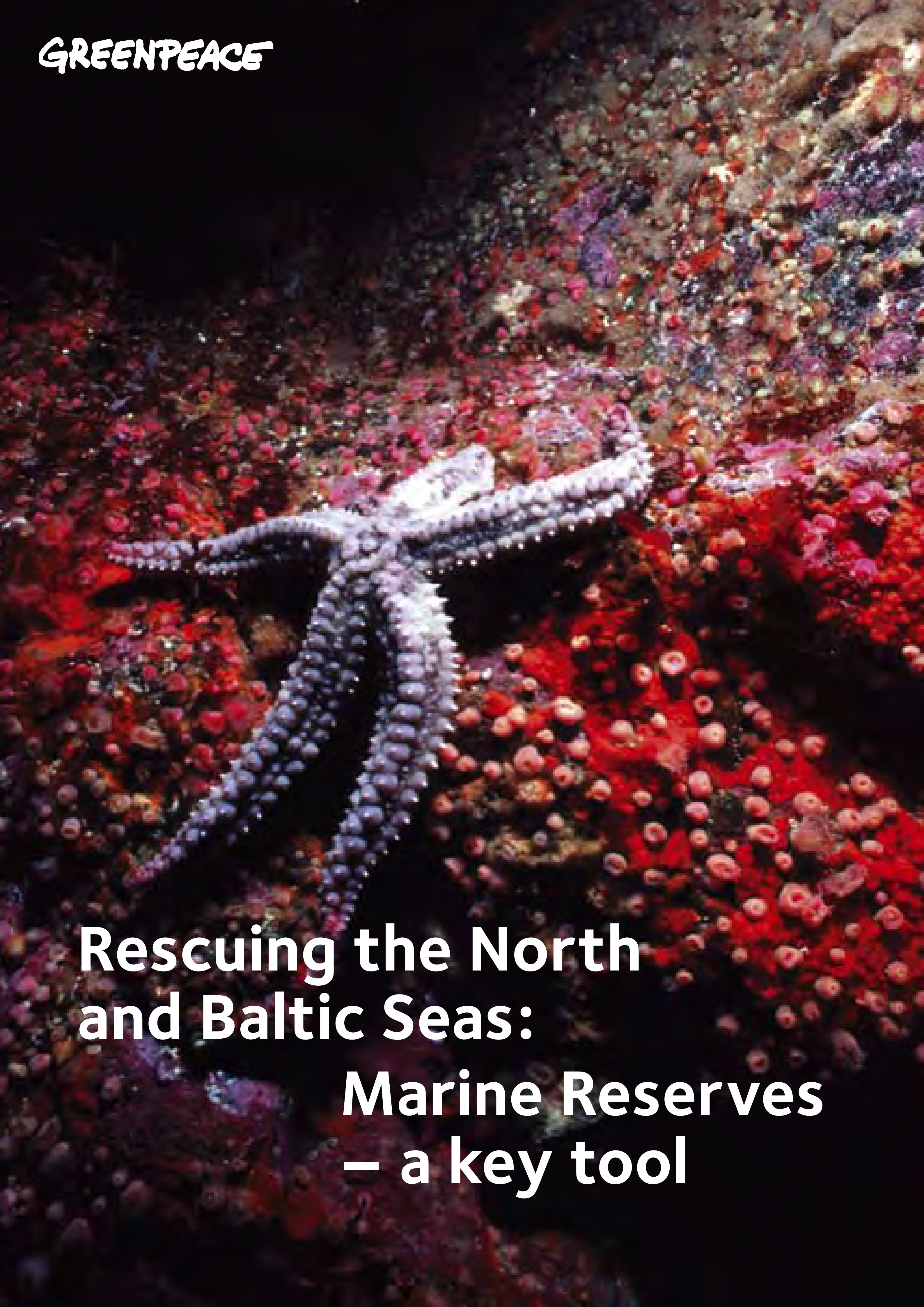

Rescuing the North and Baltic Seas:

Marine Reserves – a key tool

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Executive summary

This report describes the multiple threats now jeopardising the marine life and ecology of the North Sea and Baltic Sea. It proposes an approach to countering these threats involving the establishment of networks of large-scale marine reserves in which fishing and other extractive activities are prohibited. Finally, it considers what progress has already been made towards the effective conservation of the North and Baltic Seas, and assesses the opportunities towards that goal afforded by recent political developments.

Fisheries represent perhaps the greatest single threat to North Sea and Baltic ecosystems. Overfishing has left stocks of many key commercial species close to collapse while governments have put short-term political and economic interests ahead of effective management. The plight of cod is a striking example: by 2001 the North Sea breeding stock had been reduced to one-sixth of its 1970s level, and the Baltic stock too is increasingly threatened. Yet politicians continue to ignore scientific recommendations for a complete ban on cod fishing in the North Sea and severe quotas in the Baltic.

Overfishing is not simply a matter of landing too many fish – it also includes the hidden statistics of fish which are caught and then discarded dead, because they are damaged or too small, or because quotas have already been reached. In some fisheries, as many as three-quarters of the fish caught are discarded in this way.

Industrial fishing for small species such as sandeels to be rendered into oil and fishmeal is a source of special concern. By removing a vital link in the food web, it endangers populations of larger fish species as well as seabirds.

In addition to the threats posed by overfishing, some fisheries have high rates of bycatch (the accidental capture of non-target species), which is a particular problem for dolphins and porpoises. Other types of fishing, such as bottom trawling, are highly destructive of seabed habitats and their biodiversity – as is the **dredging of sand and gravel** for the construction industry, which has devastated some shallower areas of the North Sea.

The other major threat to North Sea and Baltic ecosystems is the pollution that enters the seas from a wide range of sources, including nuclear plants, oil exploration, industry, agriculture, waste disposal and sewage. Of particular concern are persistent organic pollutants – man-made chemicals which break down very slowly and can accumulate in the bodies of living animals. Chemicals of this class may be responsible for reduced fertility in Baltic seals and immune system depression in their North Sea cousins - making them more vulnerable to the deadly phocine distemper virus, which has taken a heavy toll in the last decade.

Eutrophication (nutrient enrichment) caused mainly from agricultural runoff and transport emissions leads to increased growth of algae whose subsequent decomposition starves the seabed of oxygen, turning areas of the Baltic into dead zones. Eutrophication has resulted in serious changes in the ecosystem in parts of the Baltic. Global warming is exacerbating this problem.

Finally, shipping is a serious source of pollution – not only the risk of accidental spillages but also the routine flushing out of oil and chemical tanks and ballast water at sea. Recent designation of the Baltic and parts of the North Sea as Particularly Sensitive Sea Areas are steps in the right direction, but with the handling capacity of Baltic oil ports growing rapidly and the continued use of sub-standard oil tankers, the risk of a major disaster is still high.

These threats together constitute a pressing challenge which governments and institutions must address urgently by all available means. To protect our region's seas in the long term, narrow sectoral management must give way to an integrated approach which takes the vulnerability of ecosystems as its starting point and regulates all threats in that light. First and foremost, however, we need a radical change in our approach to fisheries, encompassing new techniques to reduce bycatch and damage to habitats, strict quotas within ecological limits, and most importantly a new system of no-take **marine reserves.**

Such reserves should encompass spawning, nursery and feeding grounds as well as migration routes of key fish species, allowing large numbers of fish to reach a high age and breed, and thus helping to reverse the catastrophic dwindling of fish populations. The reserves should be off limits to waste dumping and mineral extraction as well as fishing, and will also need to include areas where all human activities are prohibited.

Greenpeace believes that establishing networks of such large-scale marine reserves is an essential tool to start restoring the declining health and biodiversity of the North and Baltic Seas. To be effective, these networks should cover 40% of the total sea area.

Realising this goal will require extensive co-operation between both governments and international institutions. Though marine conservation in the region has been addressed by a number of international conventions and through the policies of the European Union, little concrete progress has so far been made – not least because of the sectoral fragmentation of policy-making.

Within the EU, the **Common Fisheries Policy** has consistently failed to conserve fish stocks or protect the marine environment. At the same time the EU's main conservation instruments, the **Birds and Habitats Directives,** have proved inadequate to deliver a system of marine reserves; the Habitats Directive in particular is focused mainly on terrestrial habitats. The Natura 2000 network of protected sites whose creation is envisaged by the Directives has so far been implemented on a very limited scale, and its applicability offshore has been questioned. However, it may now provide a mechanism to implement the recent joint resolution of the **OSPAR and Helsinki Conventions** to establish a network of marine protected areas in the Baltic and north-east Atlantic by 2010.

Recent reports from two scientific commissions, in Sweden and Germany, to their respective governments have emphasised the urgent need for a strategic, ecosystem-based approach to marine management. This need for integrated action is also acknowledged by the European Commission's decision to develop a European Marine Strategy. On the world stage, the parties to the **Convention on Biological Diversity** recently (February 2004) committed to establishing a global network of marine protected areas by 2012, in line with the Plan of Implementation of the World Summit on Sustainable Development.

It remains to be seen whether these converging initiatives will deliver the fundamental change of attitude needed to safeguard the biodiversity of the North and Baltic Seas. Greenpeace urges national governments in the region, along with EU and other institutions, to seize this opportunity to move beyond narrow sectoral management and develop a truly integrated approach driven by the imperatives of conservation and centred on a comprehensive network of no-take marine reserves covering at least 40% of the total area of the North and Baltic Seas, backed up by strong regulatory powers and strict enforcement. Until this network is established, Greenpeace calls for immediate moratoria on all extractive activities within these areas, and a ban on cod fishing throughout the North and Baltic Seas.

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Introduction

The biological riches of the North Sea and the Baltic Sea make them of huge importance to the millions of people who live along or inland from their shores. However the close proximity of so many people and the consequent heavy use of these seas for fisheries, drilling for oil and gas, aggregate dredging and commercial shipping mean that the North and Baltic Seas now number among the most degraded shelf seas in the world. Urgent action is needed if we are to protect these precious seas and their marine life.

Fed by cold nutrient- and oxygen-rich water from the north and warmer water from the eastern English Channel, the North Sea has a diverse physical nature which provides an equally diverse range of habitats. Consequently it is home to a wide range of species, from sponges, sea urchins and shellfish to harbour porpoises (*Phocoena phocoena*) and white-beaked dolphins (*Lagenorhynchus albirostris*). Some 10 million seabirds are present in the North Sea at most times of the year, including species such as puffins (*Fratercula arctica*), guillemots (*Uria aalge*) and gannets (*Morus bassanus*). Around 230 species of fish have been recorded as living in the North Sea.

The North Sea is one of the world's most productive ecosystems. It represents only 0.002 % of the world's marine surface area, but approximately 4% of global fisheries landings are taken from the North Sea.[1] Annual catches were relatively stable at about 1 million tonnes from the beginning of the last century until the Second World War, after which they increased dramatically. The introduction of new technologies, larger and more effective fishing gear and highly efficient fish-locating equipment, together with an increase in the size and number of fishing vessels, has led to massive overfishing. In the 1960s the North Sea herring (*Clupea harengus*) and mackerel (*Scomber scombrus*) fisheries collapsed and the mackerel stock has never recovered. Now many other fish stocks are on the brink of collapse and a number of the more vulnerable, larger species with long lifespans have been fished almost to extinction. For instance the common skate *(Raja batis*) has virtually disappeared from the North Sea and the thornback ray *(Raja clavata*) is rarely encountered in the south-eastern part.

The Baltic's distinct ecology is largely determined by the fact that it is almost totally enclosed by land, and only connected to the North Sea by narrow and shallow straits around Denmark and Sweden. This limits the exchange of water with the open sea. It typically takes about 25–30 years for all the water in the Baltic Sea to be replaced. More than 200 large rivers bring fresh water into the Baltic, making it the world's biggest brackish sea. Moreover, this freshwater input, along with the fact that the Baltic is only open to the wider sea at its southern end, means that salinity decreases from south to north. As a result of this low salinity relatively fewer fish species are found in the Baltic, and the food webs tend to be simpler. This makes its ecosystems more prone to high natural fluctuations in fish populations and consequently more sensitive to human perturbations. Around 30 species of fish are caught in the Baltic, but commercial fisheries are dominated by just three species – cod *(Gadus morhua),* herring *(Clupea harengus membras)* and sprat *(Clupea sprattus)* – which make up about 93% of the total catch in the Baltic Sea and about 75% of the catch in the Belt Sea and the Sound.[2]

Pollution from land-based sources, excessive input of nutrients from agricultural runoff, transport emissions and fish-farming, oil and gas exploration and production, sand and gravel extraction, heavy shipping traffic and fishing have all left their imprint on these important marine ecosystems.

There is a growing body of scientific evidence pointing to the need to establish large-scale marine reserves – ie areas where all extractive and waste disposal activities are prohibited – if we are to preserve and restore our seas and their biodiversity. On land, nature reserves and other protected areas such as national parks are globally accepted as vital tools in ensuring the protection of terrestrial biodiversity; but sadly the marine environment has been almost entirely neglected in comparison. This report highlights the urgent need to reverse that neglect, worldwide and in the particular case of the North and Baltic Seas.

Chapter 1 – Threats to marine life in the Baltic and North Seas

Fisheries

Nearly 400 years ago, in 1609, the Freedom of the Seas was established as proposed by Hugo Grotius (known by many as 'the father of international law') and this included the absolute freedom to fish anywhere in the area more than three miles from shore, which was then called the high seas. The seas and oceans and their fish stocks were deemed so large that it would be impossible to fish them out. Indeed coastal fishing went on for centuries without significant stock declines.

However, this vision of inexhaustible plenty is now long out of date. With the increasing size of fishing vessels and fishing gear, as well as the development of technologies such as satellite information, fish finders and GPS, we are now able to find the fish more efficiently and catch them more effectively than ever before. As a result 75% of the world's fisheries have recently been identified as fully exploited, overexploited or significantly depleted.[3] Overfishing poses a serious threat to many fish stocks in the North and Baltic Seas as well as elsewhere.

In 2002 total landings from the North Sea amounted to 2.3 million tonnes, almost a quarter of its total estimated fish biomass.[4] Close to one million tons are caught annually in the Baltic.[5] In the North Sea, overexploitation has left stocks of cod, haddock (*Melanogrammus aeglefinus*), whiting (*Merlangius merlangus*), saithe (*Pollachius virens*), plaice (*Pleuronectes platessa*) and sole (*Solea solea*) close to or beyond safe biological limits.[6] Some of the important commercial fish species in the Baltic are similarly overexploited, in particular cod. Baltic spawning stocks of herring have also decreased steadily since the 1970s, and the central Baltic herring stock is assumed to be outside of biological limits.[7]

Cod

The huge threat posed by fisheries to cod populations in both the Baltic and North Seas typifies how the governments of the region have repeatedly put short-term interests before the long-term sustainability of the fishing industry and that of the fish populations themselves and the marine ecosystems on which they depend. In the 1970s the North Sea cod spawning stock stood at an estimated 250,000 tonnes, but had declined to a mere 40,000 tonnes by 2001.[8] A reduction in spawning stock biomass inevitably leads to a reduction in recruitment (the rate at which new individuals are added to a population). A few belated protection measures, such as the temporary closure to fishing of a large area of the North Sea cod spawning grounds during 2001, have proved inadequate (in the case of the 2001 closure, mainly because it was not established until after the spawning season[9]) and the North Sea cod stock remains in imminent danger of collapse. As cod are also caught by fisheries which target other species, these fisheries too must be regulated in order adequately to protect the cod. One reason for the failure of the Common Fisheries Policy is that fish stocks of each species have been managed separately and not considered sufficiently in the context of the wider ecosystem nor from the standpoint of mixed-species fisheries.

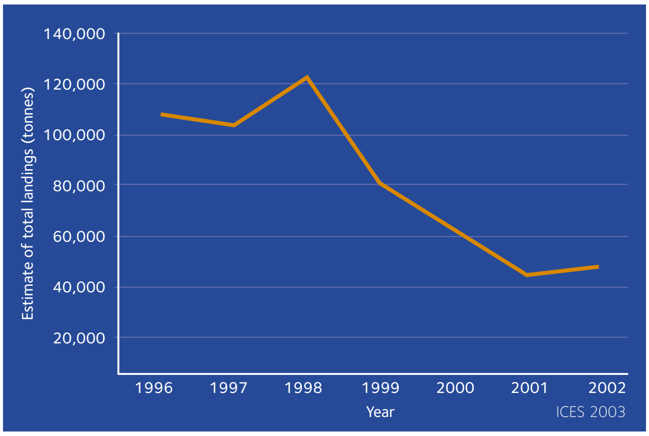


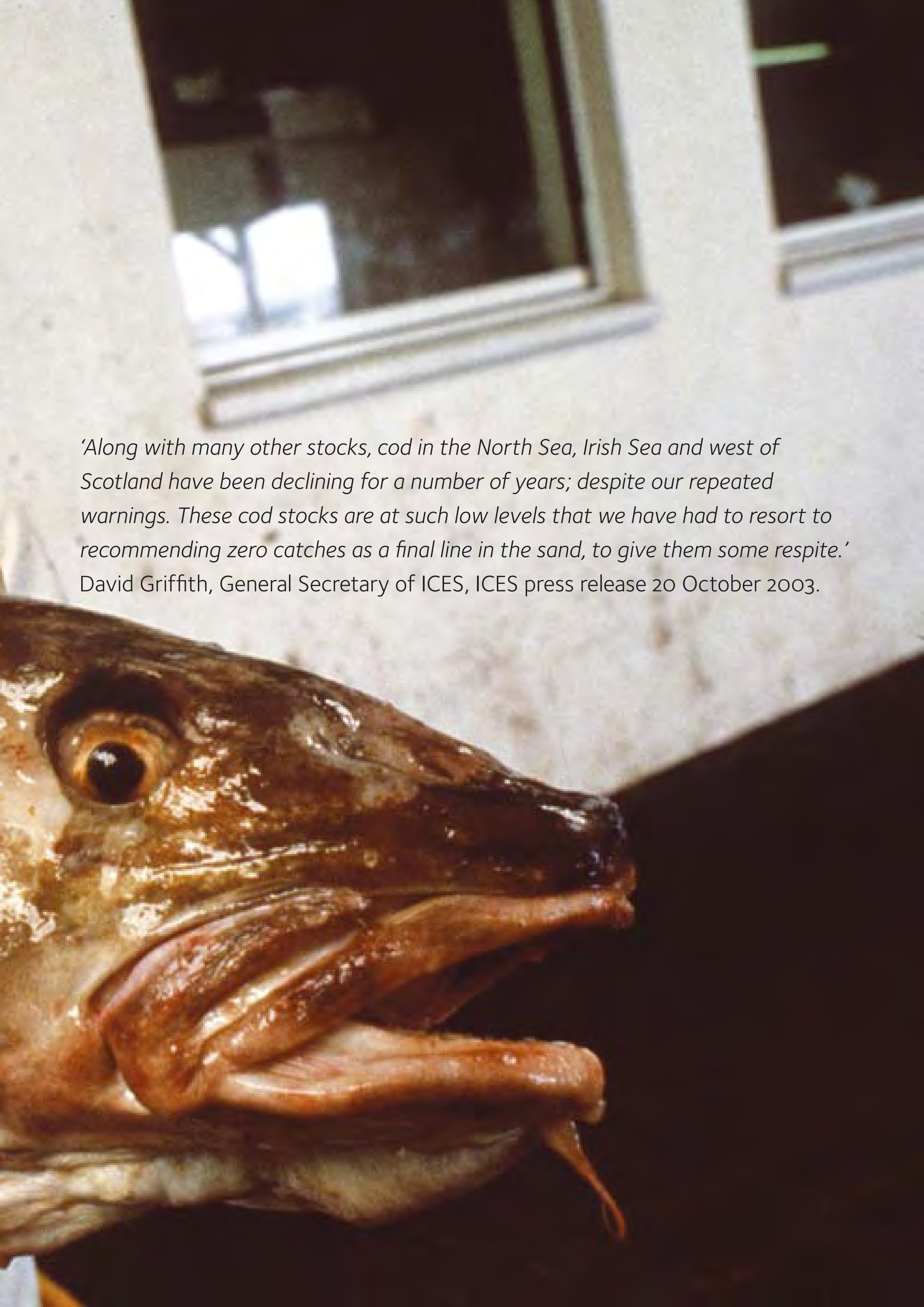
Fig 1.

The variability of environmental conditions in the Baltic Sea has a significant impact on the breeding success of the Baltic cod stock. After spawning the cod eggs sink into the depths of the sea where they drift during incubation. If the eggs end up in an area low in oxygen, they die. Of three main spawning areas in the central Baltic, only the most westerly site, the Bornholm Deep, currently has sufficient oxygen levels to allow successful development of the cod eggs.[10] Poor recruitment of cod in the central Baltic, combined with intense fishing pressure including the taking of many young cod before they have had a chance to reproduce, has meant that this cod stock is also in danger of collapse.[11] Not only is this ominous for the future of the stock itself, but since cod is the most important predator in the Baltic ecosystem it will also have serious effects on the whole ecosystem.

Scientific advice from the International Council for the Exploration of the Seas (ICES)[12] has recommended a complete ban on cod fishing in the North Sea for 2004, to give this population a chance to recover. For 2005 ICES has also advised a zero catch of cod in the Kattegat and eastern Baltic, since these stocks are both seriously depleted and are being overfished.[13] However, the fisheries ministers of the cod-fishing countries have repeatedly ignored the scientific advice they have been given, granting quotas that will inevitably bring about further depletion of the cod stocks and collapse of the cod fisheries as well as preventing recovery.

Cod, along with common skate and spotted ray (*Raja montagui*), has been included on the list of threatened and declining species and habitats in the Greater North Sea region by the OSPAR Commission for the Protection of the Marine Environment of the North East Atlantic.[14]

As overall cod stocks have declined, so has the average size of cod caught by fishermen – from 1.52m in the 1960s to 0.46m in 1996.



‘Along with many other stocks, cod in the North Sea, Irish Sea and west of Scotland have been declining for a number of years; despite our repeated warnings. These cod stocks are at such low levels that we have had to resort to recommending zero catches as a final line in the sand, to give them some respite.’
David Griffith, General Secretary of ICES, ICES press release 20 October 2003.

Bottom trawling

Bottom trawling using beam or otter trawls to catch demersal species (ie those living on or close to the seabed) such as cod, haddock, whiting, saithe, plaice and sole, is a particularly destructive fishing method. It not only removes vast quantities of fish, but also scrapes and ploughs the seabed, disrupting sediment, destroying habitat and killing large numbers of benthic (bottom-dwelling) organisms. Beam tickler chains plough the seabed to a depth of 4–8cm, while otter trawl boards may penetrate as deep as 6–12 cm into soft sediment.[15] Over time the effects of beam trawling have grown worse due to the introduction of larger and heavier gear with increased numbers of tickler chains.

Figures indicate that some 171,000km^2 of the North Sea – approximately 40% of its area – is fished by Dutch beam trawlers each year. These constitute about 80% of the total beam trawl effort in the area.[16] In the southern North Sea where the beam trawl fishery is most intensive, certain areas might be disturbed on average a staggering three or four times per year.[17]

Studies of the effects of towed gears on benthic communities in the North Sea are complicated by the fact that fishing disturbance has occurred for over a century, but it appears that there has been a shift from larger, more long-lived species to smaller, more opportunistic ones. One study reported that 90% of the resident bivalves (*Arctica islandica*) caught by commercial trawler were damaged. Mortality of these was estimated at 74–90%.[18] The use of tickler chains increases the number of individuals damaged.

The loss of large subtidal *Sabellaria spinulosa* reefs in the German Wadden Sea since the 1920s has been attributed to the long-term effects of fishing activity.[19] Reefs built by this tube-building polychaete worm provide an important habitat for a wide range of associated species, making it a key species with regard to the biodiversity of the areas in which it is found.

The habitat destruction caused by bottom trawling is so severe that some scientists have likened it to ‘clearcutting in the course of hunting deer’.[20] Another has remarked that: ‘If you could drain the North Sea, what you would see would be something like the endless muddy fields of East Anglia with not a meadow, copse or forest in sight. Almost all of the seabed is put to the trawl because there are virtually no protected areas to offer refuge to vulnerable animals like skates, sharks, corals and seafans.’[21]

Bottom trawling can also have a significant impact on the size and age distribution of fish. Trawling has been banned in the Öresund Sound, between Denmark and Sweden, since the 1930s. Studies have revealed that cod stocks there have a more normal size distribution compared to other sampled areas in which trawling is still permitted, where cod stocks are made up only of small individuals.[22]

Industrial fishing

Industrial fishing, in other words fisheries which target small fish species for conversion to fishmeal and fish oil as opposed to direct human consumption, poses another major threat to the North Sea. The main target species are sandeels (*Ammodytidae spp.*), Norway pout (*Trisopterus esmarkii*) and sprat. Landings from industrial fishing vessels account for approximately 55% of the total landing weight of fisheries in the North Sea.[23]

In the Baltic Sea industrial fisheries target mainly sprat and herring. More than half the total Baltic herring and sprat catches are currently used to make fish meal and fish oil.[24]

Sandeels are a vital link in the North Sea ecosystem. Feeding on zooplankton, they are fed on in turn by many predatory fish, seabirds, seals and cetaceans. Removal of large quantities of these small fish may lead to a shortage of food for their predators, which include several commercially important fish species, such as cod and haddock. It is difficult to determine the ecosystem impacts of industrial fisheries, but the breeding failure of kittiwake (*Rissa tridactyla*) in Shetland in the 1980s and eastern Scotland in the 1990s was traced back in both instances to a local failure in the sandeel stock.[25]

Although the industrial trawls use small mesh nets there is relatively little bycatch (see below) of non-target species in the sandeel fishery. However, the industrial fishery targeting Norway pout also takes juvenile haddock and whiting, while that targeting sprat takes juvenile herring.

Some marine biologists are concerned that industrial fisheries, by taking species from the lower levels of the marine food web, will reduce its complexity, which is likely to make ecosystems more vulnerable to damage.[26]

Bycatch and discarding

The incidental catching of non-target fish, marine mammals, turtles and invertebrates is known as bycatch. The bycatch of small cetaceans is a serious problem and a major cause of mortality for the harbour porpoise in particular. Most are caught in bottom-set gill nets, probably due to their feeding behaviour on or near the seabed.[27] Porpoises, which depend on echolocation to make sense of their surroundings, often fail to detect the thin but strong nylon fibres, become entangled and drown. One study estimated that the annual bycatch of harbour porpoises for the years 1994–98 in the Danish set-net fishery alone was around 7,000 animals.[28] Total bycatch of harbour porpoises in the central and southern North Sea are probably at a level which if continued may lead to extinction of this species in these waters.[29]

Also of great concern is the vast quantity of fish thrown overboard as discards. Discarding occurs for a number of reasons: some fish and other creatures are discarded because there is no market for them or because the quota for the species has already been taken; others are discarded because they are too small or of too poor quality to achieve the best prices on shore (this is known as 'highgrading'); and some are thrown overboard because they have been damaged. Occasionally a haul may be so large that it cannot be brought aboard, resulting in a large quantity of discards.

Over and above the death of many of the discarded fish, discarding may cause considerable disturbance in terms of ecosystem structure. The tipping of dead fish and offal (waste from processing fish onboard) back into the sea provides food for scavenging species, particularly seabirds such as fulmars (*Fulmarus glacialis*), lesser black-backed gulls (*Larus fuscus*) and herring gulls (*Larus argentatus*).[30] Over the last century there have been large population increases of these scavenging species. Conversely, waste fish that is not immediately consumed by scavengers may lead to oxygen depletion as it decomposes.[31]

Discarding also presents problems for fisheries management, as fishermen rarely present data on what and how much they have discarded. In Norway, unlike the EU, discarding is banned and all fish of commercial species that are caught are supposed to be landed. Notwithstanding this uncertainty, the total amount of waste fish and other creatures discarded annually in the North Sea has been estimated at 262,200 tonnes of roundfish, 299,300 tonnes of flatfish, 15,000 tonnes of skates, rays and dogfish and 149,700 tonnes of benthic invertebrates.[32] In addition 62,800 tonnes of offal is also dumped overboard.[33] In all, this represents 4% of the North Sea's total biomass of fish and approximately one quarter of the total annual landings.

Data from the North Sea fisheries indicates that around 12% of the total cod catch and 40% of the plaice catch (by weight) was discarded in 2000 and 2001.[34] A recent article concerning research being conducted by the Dutch Fisheries Institute on Dutch beam trawlers has found that the current discard rate of plaice is on average 77% of the total catch of the species.[35]

Beam trawling is responsible for about half the discards in the North Sea. Deepwater gill nets for hake and tangle and trammel nets for other species such as monkfish (*Lophius piscatorius*), turbot (*Scophthalmus maximus*) and rays are also problematic. Long soak times mean that often the nets contain spoiled or damaged fish which are then discarded.

Swedish sampling of discards in the Skagerrak has focused on the trawl fisheries for fish, Norway lobster (*Nephrops norvegicus*) and Northern prawn (*Pandalus borealis*). Strong year classes of haddock and plaice are reflected in a significant amount of discard of these species. Roundnose grenadier (*Coryphaenoides rupestris*), rabbitfish (*Chimaera monstrosa*) and significant amounts of witch flounder (*Glyptocephalus cynoglossus*) are discarded by the Northern prawn fishery. In the Kattegat, sampling of discards focuses on trawl fisheries for fish and Norway lobster. Mixed fisheries for fish and Norway lobster are conducted throughout the year, with significant discards of whiting.[36] According to the Danish Institute for Fisheries Research, the trawl fishery for Norway lobster in the Kattegat has a discard rate of about 70%, while bottom trawling in Skagerrak has a rate of about 40%.[37]

Swedish sampling of discards in the Baltic has mainly dealt with trawl and gill-net fisheries for cod. The proportion of discards of cod in trawl fisheries is reported as about 5–8 % and for gill-net fisheries 1–3% by weight.[38] The Danish Institute for Fisheries Research, on the other hand, estimates the discards in bottom-trawl fisheries in the western part of the Baltic at almost 22%, and in the eastern part at about 14%. For gill-net fisheries the figures are 7% and 2% respectively.[39]

Marine mammals

The most common marine mammal species found in the North Sea are common seal (*Phoca vitulina*) (also known as harbour seal), grey seal (*Halichoerus grypus*), harbour porpoise, white-beaked dolphin, white-sided dolphin (*Lagenorhynchus acutus*) and minke whale (*Balaenoptera acutorostrata*). Common dolphin (*Delphinus delphis*), Risso's dolphin (*Grampus griseus*), long-finned pilot whale (*Globicephala melas*), orca (*Orcinus orca*) and sperm whale (*Physeter macrocephalus*) are also regularly spotted.

The Baltic has fewer species of marine mammal than the North Sea, with only one native species of small cetacean – the harbour porpoise. In addition to common and grey seals, the Baltic also has an endemic subspecies of ringed seal (*Phoca hispida botnica*).

Threats to the harbour porpoise

The status of the Baltic population of harbour porpoise (which is distinct[40] from the North Sea population and the one found in the transitional waters between the North and Baltic Seas) is of special concern. Numbers have declined markedly in the last hundred years from an estimated 10,000–20,000 to perhaps as few as 600. While the species as a whole is classified as 'vulnerable' on the IUCN red list, this particular population may in fact be 'endangered'.[41] Estimating the bycatch rate for this population is extremely difficult as the low density of animals means they are only rarely seen or caught, but it is estimated that the current annual minimum bycatch is seven animals.[42] Fisheries bycatch is not the only human threat to the survival of the Baltic porpoise population – tissue concentrations of organochlorines and heavy metals have been found at levels which may be having detrimental impacts on the animals' health. Experimental data indicate that contaminant levels are in the range where adverse impacts on the immune and nervous systems would be expected to occur. Moreover post mortem research suggests that high levels of organochlorines could be linked to a high prevalence of parasitic and bacterial infections.[43]

Threats to seals

All three species of seal in the Baltic are now showing signs of recovery from the very low population levels recorded in the 1970s. Whereas hunting had been the major cause of reductions in these populations in the first part of the 20th century, the main reason for subsequent falls has been reproductive failure in female seals. This, along with other adverse health effects, has been associated with pollutants such as polychlorinated biphenyls (PCBs) and DDT, and with their respective metabolites. Recent apparent improvement in reproductive success of Baltic grey seals has been concomitant with a decrease in tissue levels of persistent organochlorines. However, colonic ulcers, which can be fatal, are becoming more prevalent in the seals and this is possibly due to the impact of new contaminants.[44]

While the overall population trend for seals in both the North and Baltic Seas is encouraging, the occurrence of outbreaks of phocine distemper virus is a serious cause for concern. Major outbreaks occurred in 1988 and again in 2002. Common seals were the species most affected – 18,000 seals of this species died from the virus in the North Sea, Kattegat and Skagerrak in 1988 and more than 20,000 in 2002. In 1988 approximately 65% of the Dutch, Danish and German Wadden Sea common seal population died; in 2002 the death rate was lower and has been estimated at 51%.[45] Both epidemics started in the Skagerrak and it is thought that the virus may have been brought to the region by harp seals (*Pagophilus groenlandicus*) from further north. While it should be noted that the role of organochlorine contaminants in these mass mortalities remains unproven, there is some evidence that the concentration of these pollutants in the seals' tissues may have influenced the ability of the animals to mount an effective immune response to this disease.[46]

Whaling

Norway conducts a commercial hunt for minke whales under an objection to a decision of the International Whaling Commission (IWC) banning all commercial whaling;[47] the country's self-assigned quota for 2004 is set at 670 whales. In 2003 a Norwegian scientific panel ruled that minke blubber was too toxic for human consumption because of its high levels of PCBs, noting that a single gram of blubber contained a tenth of the maximum safe weekly intake of PCBs specified in European Union guidelines. Another Norwegian study[48] also found high levels of PCBs in the blubber of minke whales taken by Norwegian whalers. Norwegian whalers now dump over three-quarters of each whale taken, leading to complaints from fishermen whose nets are fouled by whale carcasses.

The minke hunt began in 1930 and peaked in the 1960s. Independent scientists believe that the population was reduced by 50% or more over this period. Norwegian government scientists say that that the apparent reduction was part of a normal cyclical process. The IWC currently has two estimates for the minke population, 67,500 and 118,000: both are considered equally valid[49] though it is not known which is the more accurate

Greenpeace is opposed to all commercial whaling. The history of commercial whaling shows that it always leads to depletion of whale populations. Such depletion is all the more serious in that there are now a number of other very real threats to whales, resulting from human activities which bring about changes in the ocean environment, and whose long-term dangers are becoming ever clearer as more information is accumulated.

Oil and gas exploration

Since the 1960s the North Sea has been an important source of oil and natural gas. In the 1990s there were increases both in the amount of oil coming from the North Sea and in the number of oil platforms operating there, which rose from 300 to 475.[50] Oil is mainly found in the northern North Sea, in the British and Norwegian exclusive economic zones (EEZs), whereas the gas fields are concentrated in shallower areas, in British and Dutch waters.

Interest in oil exploration in the Baltic is now growing, and surveys show that there may be considerable assets in Polish, Russian, Lithuanian and Latvian EEZs. Exploration is already taking place in Polish waters,[51] and in March 2004 Russia's LUKoil opened the first Russian oil-drilling platform in the Baltic Sea.[52] Many environmental organisations have opposed this project, especially since it is being conducted near the ecologically sensitive area of the Curonian Spit.

There is increasing evidence[53] that the discharge of drill cuttings and chemicals during normal exploration and production operations has had significant impacts on the chemistry and biology of the marine environment surrounding test, operational and redundant wells, even at distances of several kilometres from well sites.[54] In some cases, effects have been reported to persist for many years.[55]

These concerns and documented effects have led to strict controls on the use of oil-based drilling fluids and increasing use of synthetic and water-based alternatives.[56] Although discharges of these fluids can also have significant impacts on benthic ecosystems, the markedly lower content of toxic oil components marks a substantial improvement in current operations. At the same time, however, many existing piles of drill cuttings contaminated with old oil-based formulations remain on the seabed, acting as potential long-term sources of marine pollution. Remarkably few have been properly characterised. It is estimated that as much as 1,600km^2 (representing around 0.23%) of the seafloor of the North Sea may have been affected by drill cuttings discharges over the last 30 years.[57]

A landmark decision by the OSPAR Commission in 1998 introduced a ban on the dumping of old oil and gas platforms in the north-east Atlantic, other than by justified derogation.[58] However, the extent to which this decision will also address the legacy of contaminated cuttings piles under the platforms remains to be seen.

While the introduction of water-based muds has resulted in a substantial reduction in new oil discharges from cuttings, the levels of oil released in produced water (ie water from the formation which is produced with the oil) have increased in recent years as a consequence of many oil fields nearing the end of their commercial life.[59] Despite some technical improvements, it remains difficult for operators to keep dispersed oil levels below the 40mg/l standard set by OSPAR. Control of more soluble, in some cases more toxic, components is yet more difficult; the impacts of such discharges remain under investigation.

Sand and gravel extraction

The removal of sand and gravel for use in the construction industry, coastal defence and land reclamation has serious impacts on the marine environment, destroying benthic communities and altering habitats. Marine resources account for as much as 15% of the consumption of these materials in some countries.[60] The shallower parts of the North Sea are the main production areas, with Denmark, the Netherlands and the UK the largest exploiters.[61] Marine aggregates are also traded commodities in Europe, with the Netherlands and Belgium for example strongly dependent on imports mainly from the UK and Germany.[62] In the five years from 1992 to 1997 the amount of sand and gravel extracted from the North Sea increased by 34% from 34 million cubic metres to 45.6 million cubic metres annually.[63]

Marine sand and gravel resources are widely distributed in the Baltic Sea. They are exploited around Denmark, Germany, Finland and the St. Petersburg region of Russia. Poland has also exploited them at a lower level. Sweden stopped exploitation in 1992 for environmental reasons. For other countries, including Lithuania, Latvia, Estonia and the Kaliningrad region of Russia, exploitation of marine aggregates might become significant in the future.[64]

Where marine aggregates are removed so are benthic organisms. Benthic biomass may be reduced by as much as 80% in affected areas and it may take up to 10 years for regeneration to take place.[65] Impacts will vary according to local conditions. In the Wadden Sea extraction sites have been found to refill very slowly and the bottom fauna has not fully recovered even after 15 years, large, long-lived bivalves being particularly affected.[66]

Indirect effects of aggregate extraction include the creation of sediment plumes which may smother benthic organisms, and the resuspension of toxic contaminants into the water column. Extraction of marine sediments may also have impacts on local hydrographic conditions.

A proposal for a new extraction site west of the German North Sea island of Sylt has been strongly criticised by Birdlife International. This long-term operation is planned to run until 2051 and would reduce the seabed level by 2.6 metres. The proposed extraction site is also a proposed protected area and has already been identified as an Important Bird Area – the Eastern German Bight. Large numbers of birds winter in the area, including around 200,000 common scoters *Melanitta nigra*, and the site is also close to an identified harbour porpoise breeding area.[67]

Shipping

The North and Baltic Seas contain some of the world's busiest shipping lanes. Some 200,000 ships cross the North Sea every year.[68] In the Baltic Sea, around 2,000 sizeable ships are normally at sea at any one time, including large oil tankers, ships carrying dangerous and potentially polluting cargoes, and many large passenger ferries. More than 500 million tonnes of cargo are transported across the Baltic each year.[69] Many goods transported by ships are hazardous (half the goods carried at sea can be described as dangerous[70]) and loss of hazardous cargoes can result in severe damage to the marine environment. Even leaving aside the potential for accidents, the discharge of chemical tank washings and oily wastes including oil-contaminated ballast and wash waters represents a significant source of marine pollution.

The introduction of alien species from the discharge of ballast water can also cause major disturbances to marine ecosystems. One example is the introduction of the marine phytoplankton species *Chatonella verruculosa*. Normally found in Japanese waters, in April–May 1998 and 2000 it suddenly started forming blooms in the Skagerrak, the northern Kattegat and adjacent areas of the North Sea. Although its toxicity is poorly understood, it has been responsible for deaths of wild and farmed fish in Scandinavian waters.[71]

The most visible and familiar environmental problem associated with shipping, however, is the oil pollution caused by tanker accidents. In addition to the gross visible short-term impacts, severe long-term problems can result. In the case of the *Exxon Valdez*, which ran aground in Alaska in 1989, biological impacts from the oil spill can still be identified 15 years after the event. In November 2002, the *Prestige* oil tanker went down off the coast of Spain with 70,000 tonnes of oil on board, which contaminated 2,890km of coastline. A few days earlier it had been crossing the Baltic and the North Sea. The risk of a major oil spill in these waters is increased by the fact that some of the tankers that routinely traverse them are still single-hulled, or have other technical deficiencies or poorly trained crews.

The Baltic is especially vulnerable due to the combination of its unique ecoystems, its difficult weather conditions (including sea ice) and its many oil ports. The ports of Ventspils in Latvia (completed in 1961), Butinge in Lithuania (completed in 1999) and Primorsk in Russia (completed in 2002) together provide an important gateway for the export of crude oil from Russia. These three ports handled roughly 500,000 barrels per day of crude oil in 2002, equivalent to 10% of Russia's net exports. In June 2004, the port of Vysotsk, near Viborg in the Russian part of the Gulf of Finland was opened. Smaller quantities of crude oil and significant quantities of petroleum products are also distributed via other Baltic ports. Export capacity in the Baltic region has nearly doubled since 1999.

Greenpeace has been active at sea and in the International Maritime Organisation (IMO) to secure stricter regulation to reduce the risks posed by unsafe shipping in the region. In April 2004, the IMO classified the Baltic Sea as a Particularly Sensitive Sea Area (PSSA)**.** Greenpeace welcomes this decision and encourages the Baltic Sea states to strengthen the safety of shipping in the region by introducing stringent associated protective measures within the PSSA, covering ship construction, quality of crew, full liability for all actors involved and increased possibilities for coastal states to regulate traffic.

Pollution

One of the most significant impacts of human activity on the North and Baltic Seas is marine pollution. Pollutants are introduced directly and indirectly from a wide range of sources:

- domestic sewage
- industrial discharges
- leaching from waste tips
- atmospheric fallout
- urban and industrial runoff
- accidents (spillages and explosions)
- oil production
- mining
- agriculture (nutrients and pesticides)
- sea dumping operations
- ballast dumping and tank washing by ships
- radioactive discharges
- natural pollutant sources, eg volcanoes and forest fires.

Land-based sources are estimated to account for around 44% of the pollutants entering the sea and atmospheric inputs for around 33%. Maritime transport, meanwhile, accounts for some 12%, with the remainder being attributed to dumping at sea.[72]

The impacts of pollution vary according to the pollutant in question. Eutrophication resulting from high inputs of nutrients, particularly phosphates and nitrates, affects both the North and Baltic Seas. These nutrients, largely from agricultural runoff and transport emissions, stimulate an excessive growth of phytoplankton (microscopic algae) in the water, making it cloudy. In the Baltic, the distribution of the familiar seaweed bladder wrack (*Fucus vesiculosus*), a key species in the ecosystem, is pushed back as the water becomes cloudy with phytoplankton. Fast growing, filamentous algae has overgrown other algae with devastating consequences.. These changes have destroyed important spawning habitats for fish and caused serious ecosystem level changes in species composition.

These algal blooms are short-lived, and when the microscopic organisms die they sink to the seabed where they decompose. Decomposition requires oxygen, and areas affected by such algal blooms may thus become anoxic (starved of oxygen). The same applies to filamentous algae which dies during the winter and falls onto the seabed, where it forms dense mats killing the benthic life underneath. The shallow Baltic Sea, with its limited exchange of waters with the open ocean, is more vulnerable to the detrimental impacts of eutrophication than the North Sea, and algal blooms have at some time occurred in all parts of the Baltic.[73] From July to early August 2003, several blue-green algal blooms appeared in the Baltic, making it one of the worst years so far.[74] Some areas of the Baltic, where the oxygen in the water has fallen to levels unable to sustain life, have become 'creeping dead zones'.[75]

The input of man-made chemicals to the oceans potentially involves a staggering number of different substances. Some

63,000 different chemicals are thought to be in use worldwide, with 3,000 accounting for 90% of the total production tonnage. Each year anything up to 1,000 new synthetic chemicals may be brought onto the market place. Of all these chemicals, some 4,500 fall into the most serious category in terms of pollution risk. These, known as persistent organic pollutants (POPs) are resistant to breakdown and thus have the potential to accumulate in the tissues of living organisms. Toxic effects of such chemicals may include so-called 'gender bending'. This is due to their ability to interfere with the internal chemistry of the body's hormones such as oestrogen and testosterone. They can also cause reproductive problems, induce cancer, suppress the immune system and interfere with normal cognitive development in children.

Marine resources represent a significant source of POPs in the diet of those living around the North and Baltic Seas. Oily fish tend to accumulate POPs in their bodies, and the chemicals are then in turn accumulated by human consumers. The rendering down of oily fish into fishmeal and fish oils and their subsequent use to feed other animals also acts as a pathway to humans. Farmed fish and shellfish, dairy cattle, poultry and pigs are all fed fishmeal in certain countries, and so meat and dairy products as well as farmed and wild fish can all act as sources of these chemicals in the human diet.

In 2004, Danish fisheries for two species in the Baltic were closed due to high dioxin concentrations in the landed fish. The salmon fishery was closed on 1 April, while in May the herring fishery east of Bornholm was closed.[76] Sweden and Finland have however continued their fisheries in the area, since both countries have an derogation from EU rules on dioxin threshold values due to domestic dietary advice already given with respect to fish from the Baltic.

Radioactive pollution occurs as a result of the normal operation of nuclear power stations. However, by far the single biggest inputs of man-made radioactive elements to the sea come from the nuclear fuel reprocessing plants at Cap de la Hague on the Cotentin Peninsula in Normandy and at Sellafield on the north-west English coast. Discharges from these two facilities have resulted in the contamination of marine life over a wide area, and radioactive elements originating from these sources can be found in seaweeds as far away as the West Greenland coast.[77]

Some sources of pollution have been brought under control by international legislation. Signatories to the London Convention have agreed to stop the dumping of radioactive and industrial waste at sea, although the dumping of contaminated dredge spoils remains an issue, particularly with regard to the high levels of the anti-fouling compound tributyl tin (TBT) present in sediments of many European harbours.[78] The OSPAR Convention (see Chapter 3) contains a commitment to eliminate marine pollution in the north-east Atlantic region while signatories to the Stockholm Convention have committed themselves to the phasing out of a number of POPs. Within the European Community, the Water Framework Directive could be expected to bring further reductions in polluting inputs, albeit over a very long time-frame. The additional benefits of the new EU REACH (Registration, Evaluation and Authorisation of Chemicals) initiative, which aims to regulate the production and use of dangerous chemicals at source, remain to be seen.

Climate change

It is hard to predict the effects of anthropogenic climate change on the ecology of the North and Baltic Seas in the long term.

It is clear, however, that increasing sea temperatures have already had discernible effects on the ecology of the north-east Atlantic. 2002 was one of the warmest years on record and this was reflected in the composition of the plankton community. The Sir Alister Hardy Foundation for Ocean Science (SAHFOS) has been collecting data from the North Atlantic and the North Sea on the biogeography and ecology of plankton since 1931. Results of the 2002–03 continuous plankton recorder (CPR) survey revealed geographical shifts in many populations and changes in the timing of seasonal life-cycle events within those populations.[79]

Fluctuations in plankton composition and abundance will of course have consequences for organisms higher up in the food web. A recent study concluded that rising temperatures in the North Sea since the mid-1980s have modified the plankton community in such a way as to reduce the survival rate of young cod, and that these changes exacerbate the impact of overfishing.[80]

While the North Sea is currently experiencing a rise in temperatures, climate change may in the longer term result in a dramatic drop in sea temperatures around Europe. Results from a recent study by Woods Hole Oceanographic Institution add to a growing body of evidence indicating that shifts in the oceanic distribution of fresh and saline waters are occurring worldwide in ways which suggest links to global warming and possible changes in the earth's hydrological cycle.[81] Continued freshening of northern North Atlantic waters could reach a point at which ocean circulation is disrupted and the Ocean Conveyor slows down. The Conveyor helps draw warm Gulf Stream waters northward in the Atlantic, pumping heat into northern regions and significantly moderating winter air temperatures, especially in Europe. Should the Conveyor slow down then the North Atlantic region would cool considerably.

Recent research from the Plymouth Marine Laboratory has also highlighted potentially widespread consequences of a lowering in the pH of ocean waters as a result of ongoing emissions of fossil fuel-derived CO_2, or a catastrophic release of CO_2 'stored' in undersea reservoirs. Although pH changes may be relatively small, such acidification of seawater could have dramatic consequences for its chemistry and thus for the availability of nutrients to the plankton community.

To combat climate change, Europe's governments must switch to renewable energy sources. Offshore wind energy is particularly suited to delivering very large-scale power to north-western Europe, with its extensive coastlines and high winds. A study by international energy consultants Garrad Hassan shows how offshore wind could, with appropriate investment, produce 30% of the EU's electricity by 2020.[82]

'In many ways, this is a special time in the history of the sea. Humans have developed the ability to disrupt entire seas and oceans. Yet, when human impact ceases, many marine ecosystems rebound prodigiously. It is unclear how long this good luck will continue. Some rebounds, such as those of turtles or sharks, may never occur. However, if the sea is protected now, it is reasonable to expect that it will recover a substantial part of its former glory. Capturing that glory is a legacy for the future – not only in terms of the species it protects but also in terms of the human lifestyles it will preserve. The tool to protect the future of our oceans is marine reserves.' ref. Palumbi, S.R. (2002)

Chapter 2 – Marine reserves: a key tool in rescuing the North and Baltic Seas

It is time for a radical change in fisheries and conservation management in our seas and oceans, the better to both conserve fish stocks and protect biodiversity in general. To achieve sustainable use of living marine resources, the ecology of species and of the whole ecosystems on which they depend must both be taken into account. This is the ecosystem approach. Marine reserves are a key tool for realising these goals.

Marine reserves: definitions and terminology

Historically, protected areas have been established to conserve some special feature of nature: endangered and rare species, beautiful scenery and so on. Most well-known examples are on land. In recent years, however, Marine Protected Areas (MPAs) have increasingly been introduced as a nature conservation tool in coastal areas. Most of these harbour special coastal ecosystems such as coral reefs, mangrove forests and intertidal flats (often of great importance for wading birds). As of 2000, roughly 0.5% of the total area of the world's seas and oceans was protected (nominally, at least) by MPA designations.[83] MPAs are generally open to recreation and tourism, and over 95% of them are also open to fishing. There are very few nature conservation areas offshore and none on the high seas.

There is a bewildering variety of terms and definitions currently in use to denote marine conservation areas. They include marine protected areas (MPAs), marine sanctuaries, marine reserves, fully protected marine reserves, ocean sanctuaries, ocean wilderness areas, marine parks, underwater parks and no-take zones. Many of them have very different levels of associated protection, and the range of activities allowed or prohibited within their boundaries varies considerably.

In an attempt to clarify this situation, Greenpeace has analysed the IUCN and CBD categorisations of nature conservation areas (see box), and has developed a simple structure of three fundamental levels of protection that should provide an adequate framework for the safeguarding of the oceans and seas:

1. Completely protected areas (ie off limits to all human activities) for species or ecosystem conservation goals or as scientific reference areas;
2. Areas where all extractive uses are excluded but other activities are permitted; and
3. Sustainable use of the wider marine environment.

Given that sustainable use of the marine environment should apply to the entirety of the world's seas and oceans, Greenpeace has then arrived at the following definition of marine reserves.

Large-scale marine reserves are areas that are closed to all extractive uses, such as fishing and mining, as well as to disposal activities. Within these areas there may be core zones where no human activities are allowed, for instance areas that act as scientific reference areas or areas where there are particularly sensitive habitats or species.[A]

Some areas within the coastal zone may be opened to small-scale, non-destructive fisheries, provided that these are sustainable, within ecological limits, and have been decided upon with the full participation of affected local communities.[B]

IUCN and CBD protected area categories

The International Union for the Conservation of Nature/World Conservation Union (IUCN) has categorised the different types of nature conservation area (albeit looking mainly at terrestrial rather than marine examples) and the levels of protection they afford as follows:

1 Strict Nature Reserve - Wilderness Area
managed mainly for science or wilderness protection
1a Strict Nature Reserve - protected area managed mainly for science
1b Wilderness Area - protected area managed mainly for wilderness protection

2 National Park
managed mainly for ecosystem protection and recreation

3 Natural Monument
managed mainly for conservation of specific natural features

4 Habitat/Species Management Area
managed mainly for conservation through management intervention

5 Protected Landscape/Seascape
managed mainly for landscape/seascape conservation and recreation

6 Managed Resource Protected Area
managed mainly for the sustainable use of natural ecosystems.

The Conference of Parties to the Convention on BiologicalDiversity (CBD), however, distinguishes only two levels of marine conservation area (decision VII/5):

(i) Marine and coastal protected areas, where threats are managed for the purpose of biodiversity conservation and/or sustainable use and where extractive uses may be allowed; and

(ii) Representative marine and coastal protected areas where extractive uses are excluded, and other significant human pressures are removed or minimised, to enable the integrity, structure and functioning of ecosystems to be maintained or restored.

[A] Within the EU, these core zones are likely to include Natura 2000 sites such as Special Areas of Conservation under the Habitats Directive and Special Protection Areas under the Birds Directive.
[B] In the European context this would apply to the area within the 12 nautical mile territorial limit.

Marine reserves as a tool to protect biodiversity

The specific role of marine reserves in fisheries management is outlined in detail in the next section. However the role of marine reserves extends beyond ensuring sustainable fisheries per se to protecting biodiversity for its own sake.

Ecosystems by their very nature not only include habitats and all the species that inhabit them but also the complex interactions between these species. As outlined in Chapter 1, both the North Sea and Baltic Sea provide examples of areas that have been affected for over a century by a myriad of threats to ecosystem integrity.

Broadly speaking, ecosystem damage can occur through four different avenues:

- Target species can be specifically depleted, eg by overfishing.
- Ecological shifts can occur because of removal of important species.
- Habitats can be damaged through destructive activities, e.g. bottom trawling, sand and gravel extraction.
- Climate change and/or pollution can affect the baseline health of an area and the interactions within its ecosystem.[84]

Marine reserves can directly address the first three categories. They can also indirectly address non-site-specific impacts such as eutrophication and climate change, inasmuch as healthy marine ecosystems are likely to be more resilient to these threats.

Scientists have done much work on establishing criteria as to which locations should be chosen for protected areas. Exact ecological criteria to choose specific sites within a network of marine reserves will depend on the specific situation in each area or region. Ecological criteria listed by Roberts et al.[85] are:

- biogeographic representation
- habitat representation and heterogeneity
- human threats
- natural catastrophes
- size: export, viability, disturbance, management
- connectivity: offspring, movement, transfer of material
- vulnerable habitats
- vulnerable life stages
- species or populations of special concern
- exploitable species
- ecosystem functioning and linkages
- ecological services for humans.

Marine reserves as a fisheries management tool

Fisheries management bodies in the North and Baltic Sea countries have been aware of the downward trends in fish catches and have tried to come up with solutions, but most measures, including the use of single species quotas (known as the Total Allowable Catch) have so far failed.

A new approach to the management of fisheries is needed if they are to be made truly sustainable. A growing movement of scientists and NGOs is calling for no-take marine reserves as an essential tool in fisheries management, and the scientific evidence that such reserves work is accumulating rapidly. The merits of the concept have been extensively discussed;[86] here we supply an overview.

There are multiple benefits of no-take marine reserves for fisheries.

1. Support of fish stock management

a) No-take zones serve as dispersal centres for larval recruitment. One of the major problems with fish stocks that have been depleted by overfishing is that there are very few large fish remaining in the population. Large females are essential, because they produce many eggs of better quality. When a female doubles in length, she produces eight times more eggs.[87] These eggs show a higher level of fertilisation and better survival rates. So, a few large mature females may contribute far more to reproduction than a large number of first- time spawning females. In many fish stocks nowadays, females are taken by fisheries before or just after their first spawning year. Large mature females (cod of >1.5m, plaice of >70cm) are extremely rare.

There is no fishing technology that can prevent the catching of large fish. No-take zones are the only solution. In no-take zones, fish can grow to maturity, permitting normal reproductive patterns. With a system of well-chosen no-take zones, the total amount of fish that can be caught in the sea outside the zones will be greater than in a sea that is completely fished everywhere. The no-take zones function as reproduction 'factories'.

b) No-take zones can also offer protection to specific life stages, if they encompass areas such as spawning and nursery grounds, migration routes and feeding grounds.

i) Spawning grounds. Many fish aggregate in large number for synchronised spawning. Such spawning aggregations are attractive to fishermen, because of the large quantities of fish that can be caught. Unfortunately, as a result of the repeated targeting of spawning grounds fish often do not get the chance to reproduce. So the next generation, which would normally replenish the population, may never come into existence. For a fishery to be sustainable, fish must get a chance to reproduce before they are caught. Therefore areas where fish aggregate to spawn need to be closed at least temporarily during the spawning season.

ii) Nursery grounds. Depletion of fish populations by fisheries has to be compensated for by reproduction of the remaining stock. Protection of the areas where young fish grow to maturity increases the chances that this replenishment will occur.

iii) Migration routes. Some fish travel long distances along set routes and/or at set times. Where the fish aggregate during migration, they again form an attractive target to fisheries. The risk is that large populations from a wide area may be caught in a small area in a short time. At these times there may seem to be plenty of fish, but this of course is only because of the concentration of the stock, and does not represent a real increase. In light of this susceptibility of migratory species to rapid overfishing in migration aggregations, such areas should become no-take zones.

iv) Feeding grounds. The same logic as above applies to cases where large fish aggregations occur because of high food availability, for example as a result of oceanographic features such as upwelling areas, eddies and fronts.

c) No-take zones allow for recovery of depleted populations. A depleted fish stock recovers most quickly when it is left alone for a sufficient time. The taking of further fish from an already depleted stock will at best slow this recovery, and at worst prevent it altogether.

d) No-take zones provide an overspill of fish to surrounding seas. After the initial establishment of a no-take zone, the population of fish within it increases. With time, fish will disperse beyond the zone and can be caught in the adjacent waters. Fishermen often call this 'fishing the line' – they catch not only more fish, but bigger fish as well.

2. Support for fisheries stability[88]

a) No-take zones help to maintain a predictable and secure level of yield from a fishery. One of the side effects of depleted fish stocks is an uncertain future for fishermen. Will they be allocated sufficient quotas to make any money? Banks become more reluctant to give loans and many fishing companies have difficulties finding personnel, especially younger people. A more predictable and certain catch from year to year would solve many of these problems. No-take zones act as an insurance policy, as they facilitate reproduction and their overspill replenishes the fished areas. This guarantees a more predictable catch and thus enhances fisheries stability.

b) No-take zones reduce the total level of effort in a fishery that is either fully or over-exploited.

c) No-take zones offer improved socio-economic outcomes for local communities through the granting of specific access rights. In some cases, coastal waters can be kept open to small-scale non-destructive fishing, but closed to all other fishing methods.

To prevent the complete depletion of all fish stocks, more and more fisheries scientists are advocating that large areas be established as no-take zones. The immediate need for such areas is to give depleted fish stocks a chance to recover. Over the longer term, as detailed above, they represent a practical application of the precautionary approach to fishing: they serve as a safe haven for part of the fish stock, as breeding areas and as places where intact ecosystems can function. The need for large no-take zones is especially emphasised for large migratory species, which will move in and out of them.

Size and scaling of marine reserves

There now exist a number of studies which consider what size marine reserves have to be to achieve the objectives of protecting marine biodiversity and fish stocks. One study comes to the conclusion that: 'all arguments converge upon the importance of large-scale protection, with maximum benefits generally falling in the range of 20% to 40% of the sea in reserves.'[89] The results of another review show that the proportional differences in density or biomass are independent of reserve size suggesting that the effects of marine reserves increase directly rather than proportionally with the size of reserve. On the basis of his findings, the author proposes that 'larger reserves may be necessary to meet the goals set for marine reserves.'[90] Scientists using a model to evaluate the economic and ecological efficacy of MPAs as a fisheries management tool in the North Sea found that maximum benefits were derived from an MPA that covered 25–40% of the North Sea, placed along the southern and eastern coasts.[91]

The 1994 closure to certain fishing methods of three areas totaling 17,000km^2 on the Georges Bank in the Gulf of Maine gives an indication of how effective the establishment of large-scale marine reserves might be in the North and Baltic Seas. Although these areas are only closed to fishing for groundfish and all gears that might catch groundfish incidentally or damage their habitats, and so are not marine reserves as defined by Greenpeace, they do cover about 25% of the Georges Bank. Since their implementation there have been significant increases in the biodiversity and biomass of benthic organisms present, such as sea urchins (Echinoidea), sea fans (Gorgonacea) and scallops (Pectinidae), as well as increases in stocks of several groundfish species such as haddock, yellowtail (*Limanda ferruginea*) and witch flounder. [92]

The following factors, and their associated implications for scaling, will all need to be taken into account when determining the appropriate size of marine reserves and of marine reserve networks:

- physical regime (currents, depth, climate);
- variation of habitats/geo-structure (compare coral reefs to estuaries to deep sea mounts to the open ocean);
- size of ecosystems (mangroves, coral reefs, sea mounts, etc can be quite small, while open ocean systems are huge);
- life history strategy of species (territory size, migration: damselfish live in a territory of 2m2 on a coral reef, while whales, turtles, tuna and swordfish migrate over half an ocean every year);
- geographic units (countries, islands, EEZs: the Great Barrier Reef forms a single MPA, while many of the islands in the Caribbean are separate states);
- variation in human influence (eg a sewage pipe, river outflow and pollution through the air); and
- variation in human use (eg small-scale local fisheries compared to large industrial trawlers).

For instance, many tropical islands have narrow fringing reefs (sometimes only 150m wide) around them, beyond which the deep oceans start immediately. Along many continents the continental shelf extends for hundreds of kilometres, as is the case with the North Sea. Accordingly, a network for a fringing reef should be designed on a different scale to one for a continental shelf sea. The different scales of exploitation must also be reflected. A network along a coastline with artisanal, low-technology fisheries can be designed on a scale of kilometres, especially if non-migratory fish predominate. A good example of a local small-scale network is found at St Lucia in the Caribbean, where four no-take zones have been created on an 11km stretch of narrow fringing reef. In the fishing zones in between the fishermen are now catching more and bigger fish. Obviously, on the high seas blocks of hundreds of kilometres are needed as both fish and fishing boats travel long distances. In cases where local small-scale artisanal fisheries and industrial fleets overlap the whole small-scale network has to be off limits to large vessels. The local network can be marked as one zone within the larger-scale network for industrial fisheries see Figure 2 below.

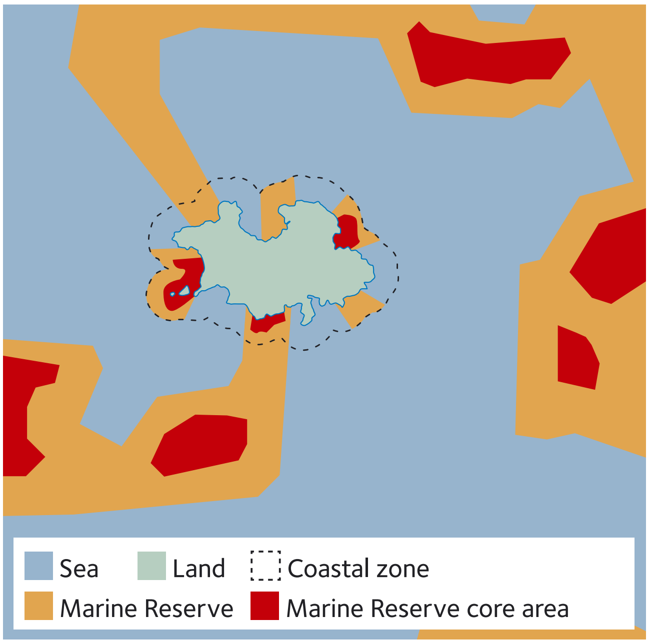


Fig 2. Theoretical example showing how marine reserve networks can be applied on different scales. Orange indicates a marine reserve area, red is the core zone area.

The dotted line around the island indicates a local network of small-scale marine reserves. Local communities operating small-scale, sustainable fisheries would be able to operate around this small-scale network in the coastal zone, but larger industrial fishing vessels would be prohibited. This whole small-scale coastal zone network should be considered as one large reserve in the large-scale network. Non-coastal fisheries operate on a larger scale for which a large-scale network of marine reserves is needed.

Greenpeace proposal

Based on this body of scientific evidence, Greenpeace believes that the establishment of large-scale marine reserves (as defined above) is essential if we are to have any chance of stopping and reversing the decline in the biodiversity and productivity of the North and Baltic Seas. In addition, complementary solutions will be needed to combat those threats, such as climate change and pollution, which affect entire regions and which marine reserves cannot address.

To be effective these reserves must be of sufficient scale (in the region of 40% of the total sea area) and designed in such a way that they protect important habitats and areas such as spawning and nursery grounds which are key to the proper functioning of the ecosystem.

Using the above ecological criteria and the best available information, Greenpeace has drawn up maps of the North and Baltic Seas showing a number of areas appropriate for the establishment of large-scale marine reserves (see methodology below).

Defining the exact boundaries of these proposed marine reserves will be an important task for the relevant and competent bodies. They will need to take into account both the best scientific information available and also practical considerations. For instance, it will be necessary to draw up the boundaries in such a way that they can be easily located at sea by both users and regulators.

The proposed areas as currently drafted by Greenpeace constitute more than 40% of the total sea area and we would expect the appropriate bodies to therefore designate bands surrounding the proposed marine reserves as 'buffer' zones where fisheries of the type permitted in the coastal zone would be allowed to operate.

It should also be noted that while Greenpeace has restricted these marine reserve proposals to the North and Baltic Seas, in order adequately to protect the North Sea the relevant bodies will need to consider establishing additional marine reserves in adjacent sea areas. For instance, the English Channel and North Sea ecosystems are closely linked, one example of a connection being that North Sea herring spawn in the English Channel.

Methodology

To identify these areas, a research team collected as many data sets as possible relating to the location of MPAs (existing and proposed), ecologically important species and habitats, various fishing activities and other potentially damaging human activities within the region. These data sets were sourced from the relevant authorities, research institutes and NGOs in the countries which encompass the North and Baltic Seas. This process is summarised in Figure 3.

The data (mainly spatial, but some quantitative) was then inputted into a Geographical Information System (ArcGIS by ESRI). This software made it possible to overlay the different data sets so enabling determination of the areas of greatest ecological value. By adding the locations of fisheries and other potentially damaging human activities, human impacts could also be assessed.

From this process, Greenpeace has identified seven potential marine reserves in the North Sea and ten in the Baltic, which together would form an ecologically coherent network.

One such area that is of crucial importance to the ecology of the North Sea includes the Dogger Bank and the area around it.

The Dogger Bank is in many ways a unique area of the North Sea with a distinct ecology. It is an area of high biological productivity, with a high level of phytoplankton production throughout the year – a consequence of the complex hydrodynamics that result in strong vertical mixing in the water column. In this respect it differs from other areas, where there is more seasonal variation.

There is a relatively high diversity of species found in the Dogger Bank area than in other areas of the southern North Sea. Heart urchins (*Spatangidae spp.*), the bivalve *Fabulina fabula* and large polychaete worms including two species of 'sand mason' (*Lanice spp.*) live in the sand.

Some commercially important fish have spawning grounds around the Dogger Bank, including mackerel, cod, whiting, plaice, sole, sandeels and sprat.[93] It is also an important feeding area for many North Sea predators. White-beaked dolphins, white-sided dolphins, harbour porpoise, gannets, fulmars and kittiwake have all been observed feeding in large numbers over the Dogger Bank.

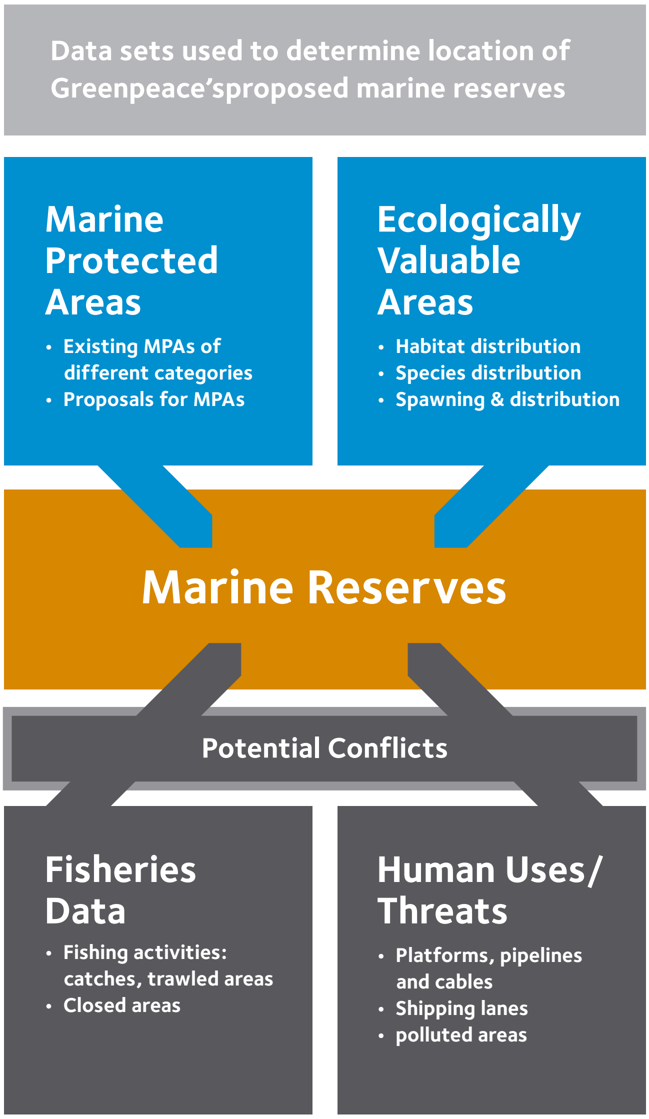
One such area that is of crucial importance to the ecology of the Baltic Sea includes the Bornholm Deep, Hoburgs Bank and the Northern and Southern Midsjö Banks.

As mentioned in Chapter 1, the Bornholm Deep is the only spawning ground in the Baltic where the threatened eastern cod stock has been able to reproduce successfully during the last couple of years. During spawning large shoals of cod aggregate in these waters, and also during other parts of the year this is one of the most important fishing grounds. About a quarter of the cod taken by Swedish and Danish fisheries in the Baltic comes from the Bornholm Deep, and the fishing area is also frequently used by fishing vessels from Poland and the Baltic states. A small section of the Deep is already closed during the summer months, but the area in question is too small and the closure period too short to protect the spawning cod aggregations.

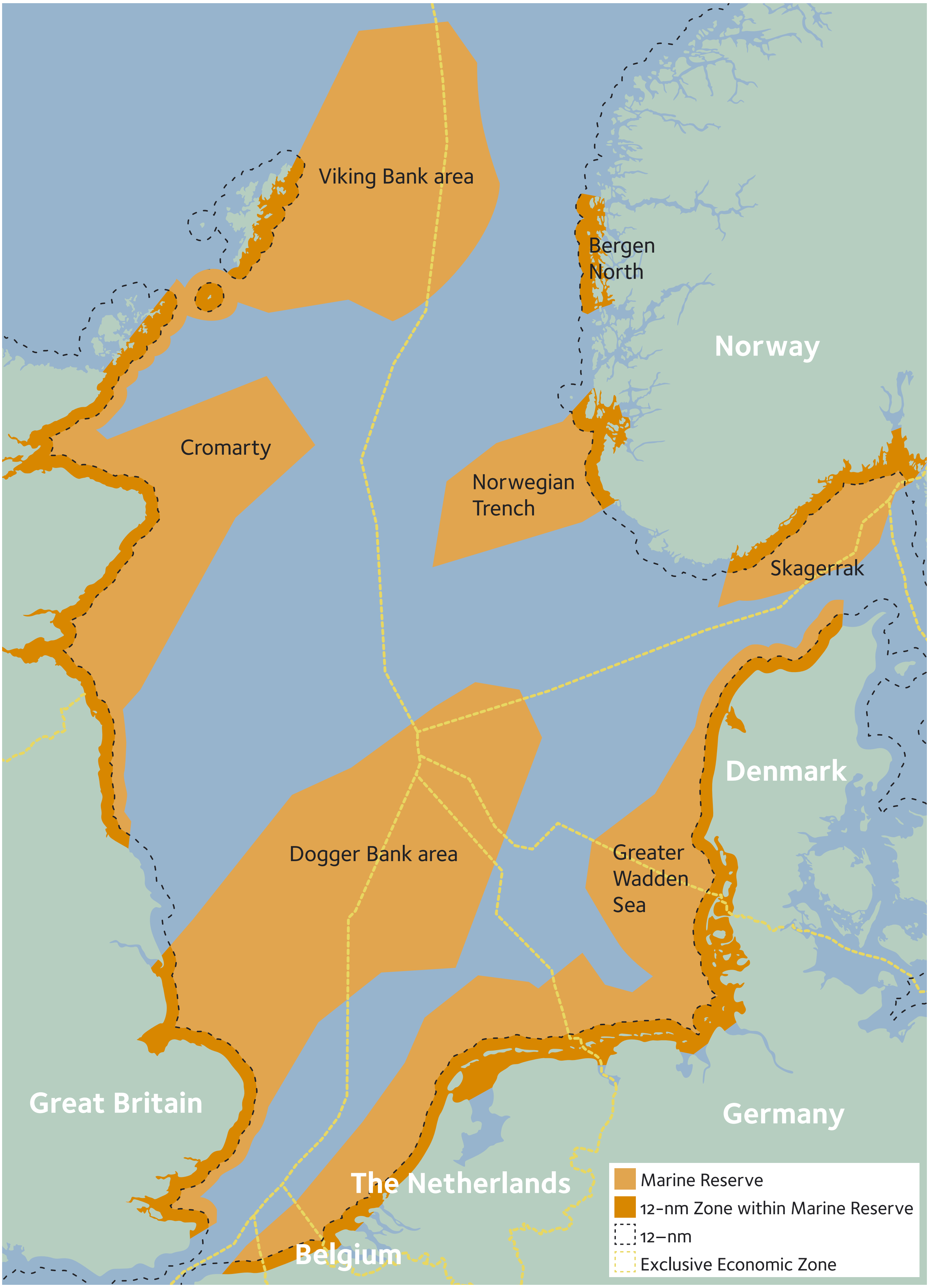
The offshore banks in the Baltic are shallow, hard-bottomed areas of the sea, situated a long way away from the coast. These banks are of a type which is unique in global terms, though they play an ecological role similar to that of the seamounts out on the high seas. The Baltic banks are very important for marine life, serving as major spawning and nursery grounds for several fish species including herring, and as important habitats for overwintering migratory birds.

Since the banks are situated a long way away from the coast they are not as affected as coastal areas by pollution and eutrophication from terrestrial sources. Consequently the water is clearer here, and seaweeds can grow in greater depths than in coastal areas. One can also find unique associations of species on the banks, eg large colonies of brown algae (*Phaeophyceae*) in association with blue mussels.

Fig 3.



Marine Reserves – Greenpeace proposals
North Sea



Baltic Sea


North Bothnia Bay
The Quark
Finland
Norway
Gulf of Finland
Sweden
The Archipelago
Russia
Estonia
Kattegat
Gulf of Riga
Latvia
Denmark
Baltic Proper inc. Bornholm Deep
Lithuania
Kaliningrad
Kaliningrad (Russia)
Big Belt and Äresund
German east coast
Poland
Germany
Marine Reserve
12-nm Zone within Marine Reserve
12–nm
Exclusive Economic Zone

Potential benefits of marine reserves

General:

- increased habitat quality, species diversity and community stability;
- provision of undisturbed control sites for monitoring and assessing human impacts in other areas;
- creation or enhancement of non-extractive, non-destructive uses, including tourism;
- reduction in user conflicts;
- provision of opportunities to improve public awareness, education and understanding; and
- creation of areas with intrinsic value.

Fishery-related:

- increased abundance, average size, reproductive output and genetic diversity of target organisms;
- enhanced fishery yield in adjacent grounds;
- provision of simple and effective management regime which is readily understood and enforced;
- insurance against uncertainty and reduced probability of overfishing and fishery collapse;
- protection of rare and valuable species;
- opportunities for increased understanding of exploited marine systems; and
- basis for ecosystem management.

(adapted from Fogarty et al. 2000)

Renewable energy developments in the North Sea and Baltic Sea

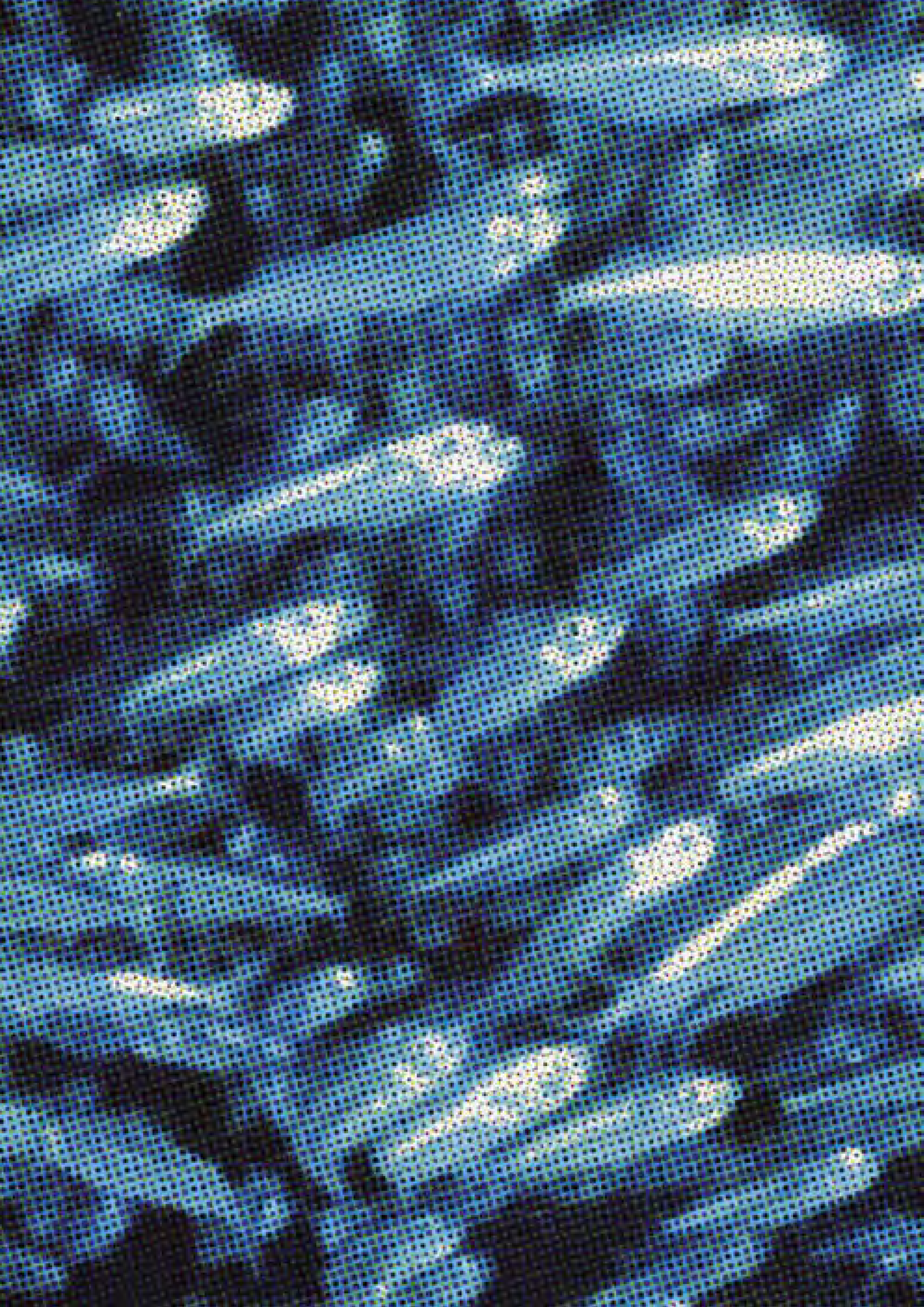
In general, Greenpeace believes there should be a presumption against any human activities in the core zones of marine reserves. However, given the urgent threat posed by climate change it may be necessary to develop renewable energy facilities in such locations subject to the following conditions:

1. There is no feasible alternative. A 'feasible alternative' must be broadly similar to the originally proposed site (depth, current, wind conditions, grid access, etc) and not present practical obstacles which prevent the scheme from going ahead.

2. Potential impacts are subject to both a Strategic Environmental Assessment and an Environmental Impact Assessment. Both should be completed before permission for construction is granted. The SEA is an assessment of government plans and policies carried out prior to their implementation, the EIA an impact assessment carried out by a developer in support of an application for project consent. The EIA must address the cumulative impacts of many development sites in a specific area and not just assess the impacts on a case-by-case basis. The responsibility for any cumulative impact assessment should always lie with the most recent developer (so that the earlier developers do not have to rewrite their EIAs).

3. Severe ecological impacts of renewable energy developments should be mitigated and/or compensated for as much as reasonably possible.

The development of renewable energy facilities in core zones should never be taken as a precedent for any other kinds of development in these areas. It is only the extreme seriousness of the climate crisis that means that a broad ecological analysis will sometimes favour renewable energy developments in core zones. There should be no automatic renewal of development permission at the end of a facility's life.



Chapter 3 – The political landscape

As the scientific case continues to grow, the concept of establishing marine protected areas (MPAs) of various kinds is beginning to take root in political processes at both the global and the regional level. This chapter offers a review of the various international instruments by which this initiative has been or is being carried forward, and assesses progress to date.

Convention on Biological Diversity and World Summit on Sustainable Development

The need to protect marine and coastal biodiversity was identified as an early priority at the first Conference of the Parties (CoP) of the Convention on Biological Diversity (CBD) in 1994. The 1995 Jakarta Ministerial Statement created a clear mandate for the protection of marine and coastal biodiversity and an expert group drew up a three-year programme of work identifying potential marine and coastal protected areas as one of five major themes.

At its most recent CoP, (CoP VII, Kuala Lumpur, Malaysia, February 2004), the parties to the CBD took a major step forward in committing to the establishment of a global network of marine protected areas by 2012 as set out in decision VII/28. This decision further specifies that this network should be composed of:

comprehensive, effectively managed, and ecologically representative national and regional systems of protected areas that collectively contribute to achieving the three objectives of the Convention and the 2010 target to significantly reduce the current rate of biodiversity loss.

This commitment is consistent with the World Summit on Sustainable Development (WSSD) Plan of Implementation. This Plan promotes the conservation and management of the oceans, and agrees to develop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive fishing practices, and the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks, by 2012.

The CBD's programme of work is explicit in stating that within the integrated network of marine and coastal protected areas there should be '**areas where extractive uses are excluded'**, and other significant human pressures are removed or minimised, to enable the integrity, structure and functioning of ecosystems to be maintained or recovered'.[94]

OSPAR Convention and Helsinki Convention

A regional framework for establishing networks of MPAs in the north-east Atlantic (including the North Sea) and the Baltic already exists as a result of commitments made under the Convention on the Protection of the Marine Environment of the Baltic Sea Area (the Helsinki Convention) and the Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention, so called because it arose from the Oslo and Paris Conventions).

In 1994, the Helsinki Convention set out its Recommendation 15/5, which states that 'the Contracting Parties shall take all appropriate measures to establish a system of coastal and marine Baltic Sea Protected Areas (BSPAs).' Furthermore it was agreed that 'management plans shall be established for each BSPA to ensure nature protection and sustainable use of natural resources.' In total, 62 BSPAs were designated under HELCOM Recommendation 15/5. Although preference was given to areas already under some form of protection, very few of the designated areas have as yet been afforded any real legal protection. Nevertheless, in 1998 another 24 offshore areas were identified and proposed for inclusion in the network.

Ministers attending the OSPAR 1998 ministerial meeting in Sintra, Portugal agreed to 'protect and conserve the biological diversity of the maritime area and its ecosystems which are, or could be, affected as a result of human activities, and to restore, where practicable, marine areas which have been adversely affected'.[95] One of the tools to be used to achieve this was agreed to be the implementation of 'a network of marine protected areas'.[96]

The OSPAR MPA network aims to:

- protect, conserve and restore species, habitats and ecological processes which are adversely affected as a result of human activities;
- prevent degradation of and damage to species, habitats and ecological processes, following the precautionary principle; and
- protect and conserve areas that best represent the range of species, habitats and ecological processes in the OSPAR maritime area.

It is envisaged as an 'ecologically coherent network of well managed MPAs'[97] which takes account of linkages between marine species, habitats and processes in a wider ecosystem perspective.

In 2003 ministers attended the first joint session of the OSPAR and Helsinki Commissions in Bremen and significantly agreed to identify by 2006 the first set of MPAs for the north-east Atlantic and the Baltic Sea, and by 2010 to complete a joint network of protected sites (Bremen Statement 2003). The delegates at the Bremen meeting also agreed to a joint programme of work to ensure consistency of approach between the two conventions, and suggested that sites identified under the Natura 2000 process be notified to the OSPAR Commission.

These two conventions provide a clear regional framework for establishing a network of MPAs in the North and Baltic Seas and also provide a means of translating commitments made under the auspices of the CBD into concrete actions at a regional level. However, there seems to be little political will to make such a network of MPAs a reality.

Most of the signatories to these two conventions are also EU members and are legally bound by EU legislation (the Birds and Habitats Directives, see below) to designate marine sites to form part of the European Natura 2000 network. However, serious shortcomings both in the Directives themselves and in their implementation mean that in their present form the Habitats and Birds Directives are unable to deliver marine reserves of the type needed to rescue the North and Baltic Seas from irreversible ecological degradation. It is nevertheless feasible that the Directives could be adapted in such a way as to provide a mechanism for realising the goals set by the OSPAR and Helsinki Conventions.

Natura 2000 and the European Union Birds and Habitats Directives

In May 1992 EU governments adopted legislation designed to protect the most seriously threatened habitats and species across Europe. This legislation is called the Habitats Directive (92/43/EEC) and complements the earlier Birds Directive (79/409/EEC) adopted in 1979. At the heart of both these Directives is the creation of a network of sites now known as Natura 2000. The Birds Directive requires the establishment of Special Protection Areas (SPAs) for birds. The Habitats Directive similarly requires Special Areas of Conservation (SACs) to be designated for a number of habitats and species (other than birds) listed in the Directive's annexes. The overall aim is to restore these habitats and species to, or maintain them at, a 'favourable conservation status'. With the exception of Germany, there has been very limited implementation of the Habitats Directive with regard to the marine environment by any of the EU Member States.

Although the wording of the Habitats Directive states that it applies to the 'European territory of the Member States' (Article 2 (1)), there has been some controversy regarding its application offshore. In a legal case in the High Court brought by Greenpeace against the UK Government in 1999 (*R v The Secretary of State for Trade and Industry, ex parte Greenpeace Ltd*), the judge held that 'the Habitats Directive applies to the UKCS [United Kingdom continental shelf] and to the superadjacent waters up to a limit of 200 nautical miles from the baseline from which the territorial sea is measured.' This judgment is binding on the UK. In addition, both the European Commission and the Council of Ministers of the EU have made statements[98] to the effect that the Habitats Directive applies to the EEZ of Member States and that what applies for the Habitats Directive also applies for the Birds Directive.

While the Annexes of the Habitats Directive do list a number of marine species and habitats requiring protection under the Directive, it is clear that the emphasis was on the terrestrial environment when the annexes were drawn up. Compared to the list of threatened and/or declining species adopted by the OSPAR Convention[99] the annexes of the Habitats Directive are clearly deficient, lacking many species, habitats and habitat complexes identified by OSPAR. The Habitats Directive's emphasis on habitats for their own sake and for the sake of particular species prevents designations on the basis of certain functional purposes, such as spawning or breeding sites, or of sites where hydrographic processes of vital ecological importance take place, such as upwelling sites, eddies, fronts, and so on.

In theory the Habitats Directive requires the strict protection, management, surveillance and monitoring of the species and habitats for which sites are designated. However the Directive's effectiveness is severely compromised by its limited powers to restrict harmful activities. One especially significant weakness is that the Directive allows for potentially damaging developments to progress for reasons of 'overriding public interest' including that of 'a social and economic nature'.

The enforcement of the Birds and Habitats Directives is also seriously hampered by the fractured and (in administrative rather than geographical terms) sectoral approach which currently characterises the management of Europe's waters. This problem is particularly apparent when it comes to the regulation of damaging fishing activities which constitute a major threat to the marine environment.

European Union Common Fisheries Policy

While nature conservation and the application of the Habitats and Birds Directives are indisputably in the domain of both the EU itself and its Member States, fisheries (and arguably fisheries conservation) outside territorial waters is the preserve of the European Union under its Common Fisheries Policy (CFP). A recent paper suggests that it is not clear whether a Member State wanting to address a particular fishery which poses an ecological threat in offshore waters should try to take action under the auspices of the CFP by persuading the Council of Ministers or the European Commission to act, or should act unilaterally.[100] Greenpeace however considers it clear that the intention of the Habitats Directive was to impose a responsibility on Member States for the protection of species and habitats listed in the directive.[c]

The CFP establishes the framework for management of fisheries in European waters, yet it has consistently failed either to conserve target fish stocks or to protect the wider marine environment. A revision of the CFP in 2002 introduced a new 'basic' Regulation 2371/2002 which defines its general scope and objectives, as well as setting out in more detail specific objectives, management measures, access conditions, and control and enforcement rules relating to fisheries. Importantly these stipulations include the application of both the precautionary principle and the ecosystem-based approach, although it is not clear how these principles will be incorporated into fisheries management decisions. The failure of the Council to act on the strongest scientific advice and place a ban on cod fishing gives little sign for optimism.

[c] On June 4 2004 Greenpeace wrote to UK Fisheries Minister Ben Bradshaw requesting that the UK Government take immediate steps to reduce the bycatch of common dolphin in the pelagic trawl fishery for sea bass (Dicentrarchus labrax) before the beginning of the next fishing season, including the banning of UK trawlers from the sea bass fishery under article 12.4 of the Habitats Directive.

It remains clear that for the long-term ecological future of European waters and in particular the North and Baltic Seas to be safeguarded, fisheries management and the conservation and protection of the marine environment must be fully integrated, and that ultimately fisheries management should be put squarely under the remit of conservation. What is true for fisheries is equally true for other industries: decisions regarding marine management should not be taken on a sector-by-sector basis but must be fully integrated, with the conservation and protection of the environment paramount.

A glimmer of hope

The concerns outlined in this report are not confined to Greenpeace and the environmental NGOs. There is a growing realisation in policy circles that the sector-by-sector approach can only exacerbate the problems relating to the ecological well-being of the North and Baltic Seas.

On June 23 2003 the Swedish Commission on the Marine Environment completed its assignment and handed over its report *The sea – time for a new strategy*[101] to the Minister of Environment, Lena Sommestad.

The Commission notes that 'current methods [of marine management] must undergo a fundamental change' and that decisions should be 'founded on the limitations of marine ecosystems'. The Commission also proposes that 'at least four areas in both the Baltic Sea (excluding the Kattegat) and the North Sea (including the Skagerrak and the Kattegat) – two coastal areas and two deep-sea areas – shall be established with fishing bans.'

Norway has also identified the need for better and more integrated protection and management of marine areas. Norway has given several cold-water coral reefs within the Norwegian EEZ permanent protection from destructive fisheries and petroleum activities and has prohibited bottom trawling in these locations. The Norwegian Parliament has also unanimously called for development of an Integrated Management Plan for the valuable and sensitive sea areas in the Lofoten and Barents Seas. This plan is intended to help balance fisheries, shipping and potential oil activities with environmental concerns and is based on the same understanding as informed the Swedish Commission – ie that the current management regime is too fragmented to be able to protect the ocean environment.

A similar report to the German Government from the German Advisory Council on the Environment,[102] published in February 2004, notes that the North and Baltic Seas are at considerable risk and face increasing pressures that demand far-reaching amendments in key policy areas. In particular the report highlights the failure of the sector-by-sector approach to marine management:

A look at the various fields of activity in marine environment protection reveals numerous sector-specific problems, deficits in action already taken and opportunities available for further action. There are also fundamental cross-sectoral goal-setting issues, obstacles to success and management deficiencies. Much of this is due to the fact that there is still no plausible strategic, institutional and instrumental basis for integrated marine environment protection policy. There are neither clear, coordinated quality assurance goals, nor is there a cross-sectoral, coordinated plan of action. Both at EU and at national level, marine environment protection is instead largely dealt with on an incremental basis and, where at all possible, lumped in with existing sectoral policies (fisheries, agriculture, chemicals, water protection policy and so on). A significant contributor to the segmentation of marine protection policy is the distribution of decision-making responsibilities and initiatives among global and regional international bodies, the EU, national governments and their regional entities. Given the cross-border, multi-sectoral nature of the problem, the involvement of all these 21 stakeholders is vital. Initiatives must thus be transparent, both in their coordination and in the division of responsibilities. Much remains to be done in this regard.

The final recommendation of the SRU (paragraph 37 in the English summary report), sets out its belief that there is a Europe-wide obligation for Member States to produce an overarching, transparent action plan, with long-term objectives and activities that are co-ordinated over space and time, in order to remedy the situation.

At the European level the Commission (DG – Environment) has initiated a process to develop a European Marine Strategy based on an acknowledgement of the inadequacies of the current situation. Greenpeace has welcomed this initiative but it is too early to judge whether it will deliver the changes required to protect Europe's seas.

Conclusion

The EU Member States must fulfil their international commitments to establish marine reserves; however the current institutional framework is insufficient to deliver what is required. The Habitats Directive in its current form is woefully inadequate in scope and lacks the necessary powers to regulate damaging activities.

National governments must act now to develop a mechanism at the EU level for establishing large-scale marine reserves. Any future mechanism must be of sufficient scope to encompass the current range of marine provisions including the CFP. Appropriate powers to regulate relevant activities, such as fishing and oil and gas exploration and production, should be an integral part of such a mechanism.

To ensure that such marine reserves are an effective tool for the conservation and restoration of Europe's seas and in particular the North and Baltic Seas, the mechanism for their establishment should be both legally binding and supported by an adequate enforcement regime.

Greenpeace acknowledges that to achieve these goals will take a number of years. In the meantime moratoria on extractive activities, including fisheries, new oil and gas exploration and sand and gravel extraction, in the areas identified on the maps must be implemented using existing instruments. Immediate steps must be taken to identify the exact boundaries of the proposed marine reserves and in order to be effective they must cover 40% of the total sea area.

Finally, the precarious situation of Baltic and North Sea cod stocks demands an immediate moratorium on fishing for this species in line with scientific advice.

Endnotes

[1] Fifth International Conference on the Protection of the North Sea 2002

[2] HELCOM 2004a

[3] FAO 2002

[4] Walday and Kroglund 2002

[5] HELCOM 2003b

[6] Coffey and Richartz 2003

[7] ICES 2004a

[8] ICES 2003a

[9] Rijnsdorp et al. 2001

[10] ICES 2003a

[11] ICES 2003a

[12] ICES 2003b

[13] ICES 2004b

[14] OSPAR Commission 2003a

[15] OSPAR Commission 2000a

[16] OSPAR Commission 2000a

[17] Gislason 1996

[18] Johnston et al. 1998

[19] UK Biodiversity Group 1999

[20] Pauly et al. 2002

[21] Prof Callum Roberts of York University, quoted in Radford 2004

[22] Statens Offentliga Utredningar 2003

[23] OSPAR Commission 2000a

[24] HELCOM 2004a

[25] ICES 2003a

[26] Pauly et al. 2002

[27] ASCOBANS 2004

[28] Vinther 1999

[29] Fifth International Conference on the Protection of the North Sea 2002

[30] Camphuysen et al. 1995

[31] International Conference on the Protection of the North Sea 1997

[32] Garthe et al. 1996

[33] Garthe et al. 1996

[34] ICES 2003a

[35] Visserijnieuws 2004

[36] Fiskeriverket 2003

[37] Krog 2004

[38] Fiskeriverket 2003

[39] Krog 2004

[40] HELCOM 2004b

[41] Reeves et al. 2003

[42] Bergrenn et al. 2002

[43] Allsopp et al. 2001

[44] Allsopp et al. 2001

[45] Muller et al. 2004

[46] Simmonds and Mayer 1997

[47] IWCa

[48] Kleivane and Skaare 1998

[49] IWC 1996

[50] OSPAR Commission 2000a

[51] Statens Räddningsverk 1996

[52] Lukoil 2004

[53] Johnston et al. 1998

[54] Olsgard and Gray 1995

[55] Daan and Mulder 1996; Holdway 2002

[56] OSPAR Commission 2000b

[57] UK Offshore Operators Association 2002

[58] OSPAR Commission 1998b

[59] OSPAR Commission 2000b

[60] OSPAR Commission 2000a

[61] ICES 2003a

[62] Harrison 2003

[63] OSPAR Commission 2000a

[64] HELCOM 1999

[65] OSPAR Commission 2000a

[66] OSPAR Commission 2000a

[67] Birdlife International 2004

[68] OSPAR Commission 2000a

[69] HELCOM 2004c

[70] OSPAR Commission 2000a

[71] ICES 2003a

[72] International Chamber of Shipping 1997

[73] HELCOM 2004d

[74] HELCOM 2003a

[75] NASA Distributed Active Archive Center 2003

[76] ICES 2004a

[77] Majborn et al. 2003

[78] Centre for Environment, Fisheries and Aquaculture Science 2003

[79] Edwards et al. 2004

[80] Beaugrand et al. 2003

[81] Curry et al. 2003

[82] Garrad Hassan and Partners Ltd 2004

[83] Roberts and Hawkins 2000

[84] Palumbi 2002

[85] Roberts et al. in press

[86] Ballantine 1999; Gell and Roberts 2003; Lubchenko et al. 2003. See also discussions at http://depts.washington.edu/mpanews and information in the MPA library at http://mpa.gov.

[87] Roberts and Hawkins 2000

[88] Ward and Hegerl 2003

[89] Roberts and Hawkins 2000

[90] Halpern 2003

[91] Beattie et al. 2002

[92] Gell and Roberts 2003

[93] Gubbay et al. 2002

[94] CBD 2004

[95] OSPAR Commission 1998b

[96] OSPAR Commission 1998b

[97] OSPAR Commission 2003b

[98] Communication from the Commission to the Council and the European Parliament on fisheries management and nature conservation in the marine environment, Brussels, 14 July 1999, COM (1999) 363 final; 2344th Council Meeting, fisheries 25 April 2001, Council Conclusions on the integration of environmental concerns and sustainable development into the Common Fisheries Policy, 8077/01, Luxembourg

[99] OSPAR Commission 2003a

[100] Owen 2004

[101] Statens Offentliga Utredningar 2003

[102] German Advisory Council on the Environment 2002

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Greenpeace is committed to defending the health of the world's oceans and the animals, plants and peoples that depend upon them.

We investigate, expose and confront unsustainable industrial fishing and other destructive activities. We challenge governments to introduce and enforce laws to protect the ocean environment and challenge industry to end its role in ocean destruction.

We support ecologically and socially responsible use of the oceans, including the rights of fishing communities to derive their livelihood from the sea.

We champion responsible scientific research to enhance understanding and appreciation of oceans and their ecosystems.

We campaign for the establishment of large-scale marine reserves to conserve and restore ocean ecosystems and species.

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