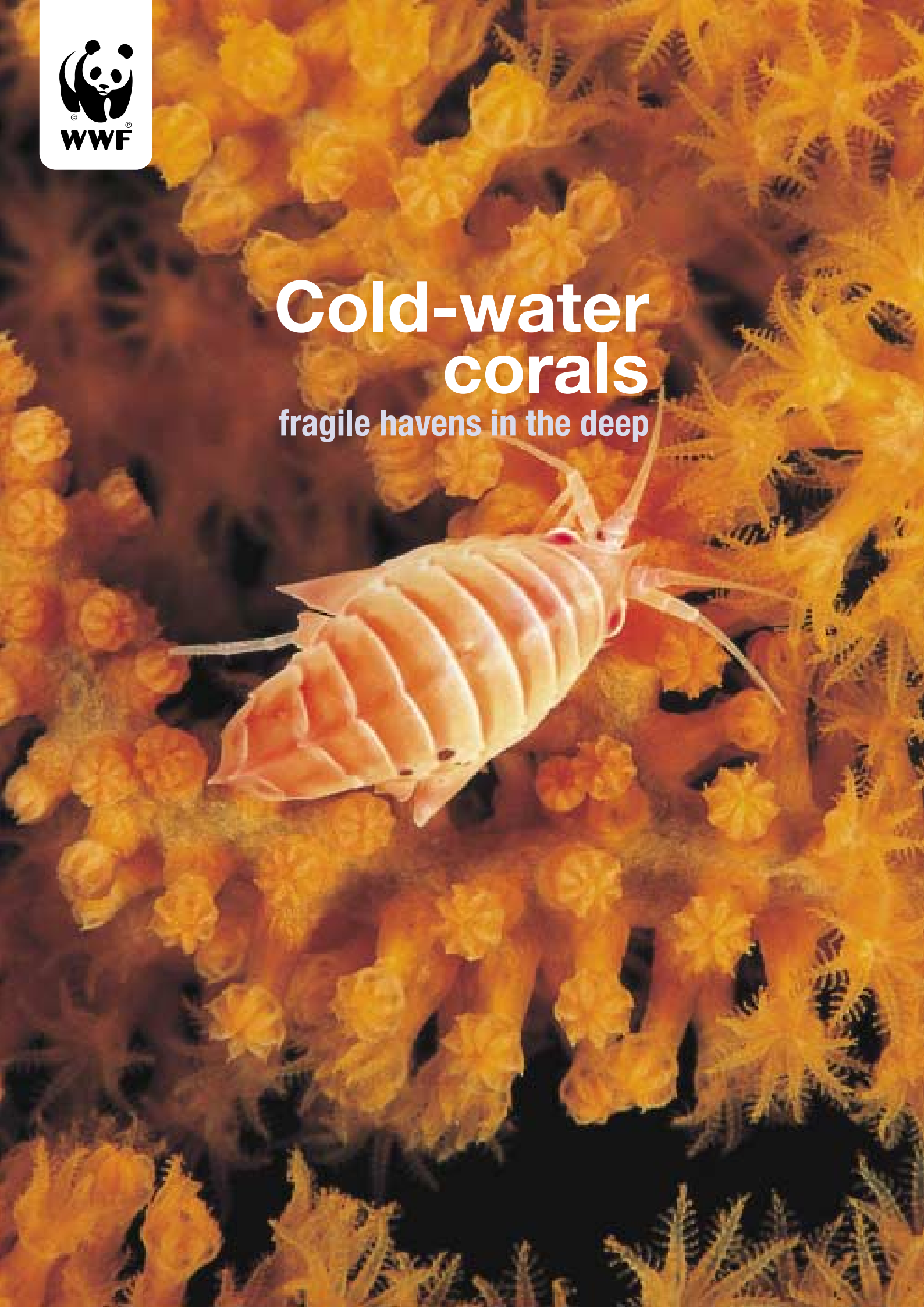

Cold-water corals

fragile havens in the deep

Cold-water corals

fragile havens in the deep

Deep in the cold, dark ocean, impressive coral reefs and thickets meander along the edges of continental slopes and seamounts. Vibrantly coloured and delicately branched corals, sponges and hydroids weave intricate structures providing living space for a multitude of invertebrates – such as lobsters, crabs, shrimps, sea fans, worms and starfish – as well as for many commercially important fish species.

Some of these stunning reefs are more than 35 metres tall and extend for tens of kilometres along the seafloor. Cold-water corals are found in all temperate oceans at depths ranging from around 40 to more than 1,000 metres, and at temperatures as low as 4°C. While individual corals may live only for a few decades, cold-water coral reefs can be very old. Parts of the world's largest reef discovered so far, the Røst Reef in Norway, are more than 8,500 years old – dating back as far as the end of last Ice Age.

Until recently, few people imagined that coral reefs existed outside the tropics. Yet, up to half of known cold-water coral areas have already been turned into rubble by harmful fishing practices – while only a handful have been legally protected. This rapid loss is all the more disturbing since about 40% of current fishing grounds are located in waters hosting cold-water corals.

Above left: *Cold-water corals are likely to occur wherever ocean currents are strong enough to transport food, temperatures lie between 4 and 13°C, and where their larvae can settle on a suitable bottom substrate to start a reef. These are polyps of Lophelia pertusa.*

Cover: *Amphipod (Stenopleustes latipes) resting on a cold-water coral (Paramuricea placomus). Trondheimsfjord, Norway.*

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Living in the dark

Cold-water corals, unlike their cousins in warmer seas, do not depend on sunlight. Tropical corals live in nutrient-poor water and host microscopic algae within their tissues; these provide energy trapped from sunlight through photosynthesis. Cold-water corals obtain their energy and nutrients wholly from trapping plankton and organic particles in passing currents, using their adhesive tentacles.

The coral reef is a permanent building site, where parts are constantly torn down and rebuilt. The reef itself is built up as the coral animal, or polyp, lays down a stony hard skeleton. Ancient portions support the living top layer, and provide space for sponges, soft coral, moss-like creatures called bryozoans, and other animals that live attached to the hard surface. Many animals bore into the coral skeleton, causing it to fall apart. In this way, new surfaces are exposed where coral larvae can settle and start a new colony, resulting in a growing reef.

Above: *In particular redfish, as well as pollack, tusk, ling, wolffish (Anarhichas lupus, pictured here), monkfish and Alaskan mackerel, claim coral areas as their home.*

Cold-water coral areas are teeming with life

With the advent of new research technologies, we are beginning to understand the extent and role of cold-water coral communities in our oceans. There is still much to learn about these fragile and hidden places, but it is clear that they are vital components of ocean biodiversity.

Across the world, over 4,200 species of cold-water coral have been recorded by scientists. These include stone corals, true soft corals, black corals and lace corals. Most do not build reefs, but instead grow in thickets and lush coral gardens, swaying in ocean currents. All are extremely fragile.

Many large reefs have been found in the northeast Atlantic, but lack of funding and expertise has left large ocean areas to map, potentially hosting reefs of equal magnitude. By providing a structured habitat with a multitude of niches for many species, coral areas are important biodiversity sinks that can play a vital role for fisheries – a haven for young commercially important fish and crustaceans. Scientists in Norway, for example, found more than 850 species living at or adjacent to *Lophelia* reefs – well in league with the huge diversity of shallow tropical reefs!

Why are cold-water corals so sensitive?

All cold-water corals are extremely fragile and vulnerable to physical disturbances due to their basic lifestyle. As surface attached animals, they cannot escape a heavy trawl or a current loaded with sediments or pollutants. The inflexible coral structure is so brittle that it is easily destroyed by almost any physical contact. Cold-water corals grow so slowly that, once damaged, it may take hundreds of years to rebuild a reef to its former splendour – if at all.

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What are marine protected areas?

A marine protected area (MPA) is an area designated to protect marine ecosystems, processes, habitats and species. MPAs can contribute to the restoration and replenishment of natural resources for social, economic and cultural enrichment.

MPAs safeguard marine resources by:

- protecting and maintaining biodiversity
- protecting vital marine habitats
- providing a safe haven for depleted and vulnerable fish stocks to breed and recover

Any change in the coral's food supply affects its growth and survival. Increased levels of sediment in the water caused by, for example, trawling, oil and gas extraction, mining or the placing of pipelines and cables, may reduce coral growth and reproduction. In extreme circumstances this could cause corals to starve to death by clogging their polyps. Altered ocean currents caused by climate change is another looming threat to these marine treasure boxes.

As they grow in places that have rarely been subject to sudden change – unlike many coastal and intertidal communities – cold-water corals have not had to develop responses to fast-occurring changes in their environment. This gives them an even greater disadvantage when facing disturbances.

Above: *In the northeast Atlantic, the main reef builder is Lophelia pertusa, which comes in several colours – from white to yellow, orange and pink. In other parts of the world, reefs are dominated by other species.*

Right: *Many of the reefs and coral gardens found in Scotland and Norway, as well as in Nova Scotia and Newfoundland, Canada, are within areas already covered by oil and gas licenses.*

©Joe Shoulak

Rockhoppers and ghost nets kill corals

For decades, fishers trawling along the continental slope in the northeast Atlantic and down both the eastern and western North American coasts, have pulled up large pieces of coral entangled in their nets. It is only recently, however, that scientists have begun to study the impacts of fishing on cold-water corals.

New technologies have enabled industry, including the fishing and oil and gas sectors, to access ocean depths previously out of reach. As many coastal fisheries have been depleted by over-sized fleets, the fishing industry's gaze has turned towards deeper seas. In the 1980s, a new type of fishing gear revolutionised deep sea fishing: the rockhopper trawl was born. This gear allows industrial trawlers to target fisheries in rugged terrain – and inevitably cold-water coral areas. A thousand year-old reef can be crushed into oblivion by a single trawler in the course of a few hours, leaving an empty scar. When the corals are gone, the habitat that provided shelter and food for so many other animals disappears. The fishing ground is thus quickly depleted and the trawler moves on to the next set of reefs – where the story is repeated.

Drifting aimlessly through the oceans are thousands of ghost gillnets, made in hardy modern materials, that have been set close to reefs and then lost or abandoned. These nets sometimes get caught on the reef and, pulled by currents, may draw the reef structure apart. Ghost gillnets continue to fish a long time after being forgotten, also trapping and drowning dolphins and turtles coming in their way.

Oil and corals do not mix

Oil and gas exploration, exploitation and decommissioning represent another threat to these vulnerable habitats. Seismic testing to locate hydrocarbon deposits using high-powered "air guns" may have dire consequences for corals, and is known to affect animals associated with corals. Hazardous substances, such as hydrocarbons, drill cuttings, sediment and mud used during extraction, can also have a detrimental impact on corals, by smothering them or poisoning them – or both. Oil platform construction, pipeline laying and maintenance can affect corals directly by crushing them and by removing rocks to which corals are attached.

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Above right and below: *Equipped with large rubber tyres, the one-tonne heavy rockhopper trawl rolls easily up and across any rough surface. The largest are capable of moving 25-tonnes boulders. Passing across the seabed, it leaves behind barren tracks of rubble where once impressive ancient reefs stood.*

©David Hall

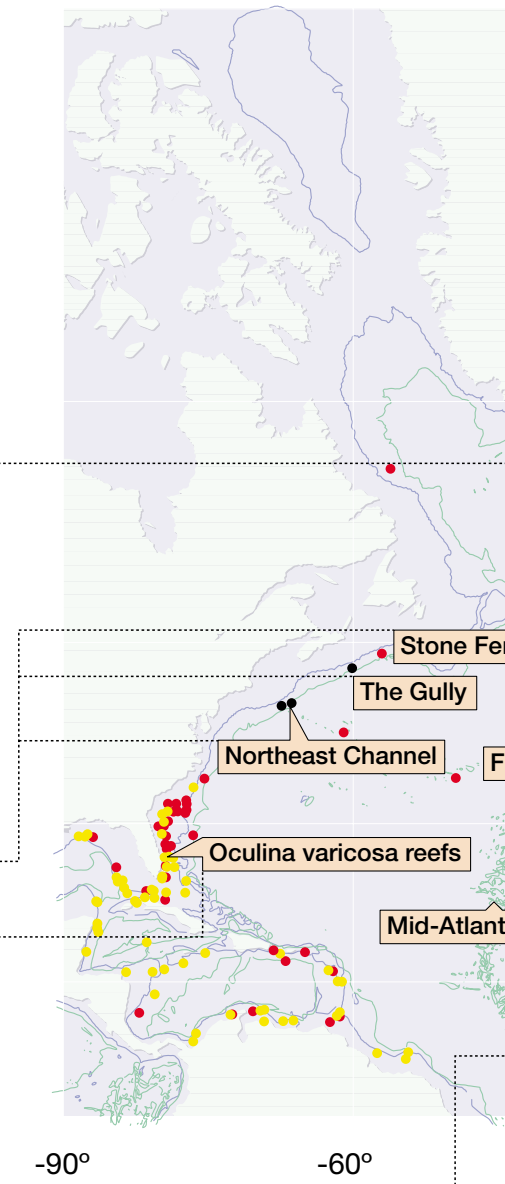
Where are they?

Cold-water coral reefs and gardens have been found and studied in places as far apart as Antartica, Australia, Canada, Ecuador, Japan, New Zealand, Norway, the United Kingdom and the United States. Most areas likely to host cold-water corals are poorly mapped and many mysteries remain even for the most studied reefs.

A few of the studied coral areas in the north Atlantic are briefly presented here.

The **Faroer Bank** between Scotland and Iceland and the **Rockall Bank**, northeast of Ireland, are two isolated and self-contained ecosystems with high biodiversity, supporting large fish populations. *Lophelia pertusa* is the most prevalent coral. These coral formations host about 300 associated animal groups. The Faroer Bank is an important fishing ground for the Faroe Islands, and fishing is regulated to preserve stocks, but no management exists at the depths of the *Lophelia pertusa* communities. Oil exploration is a potential threat to both banks.

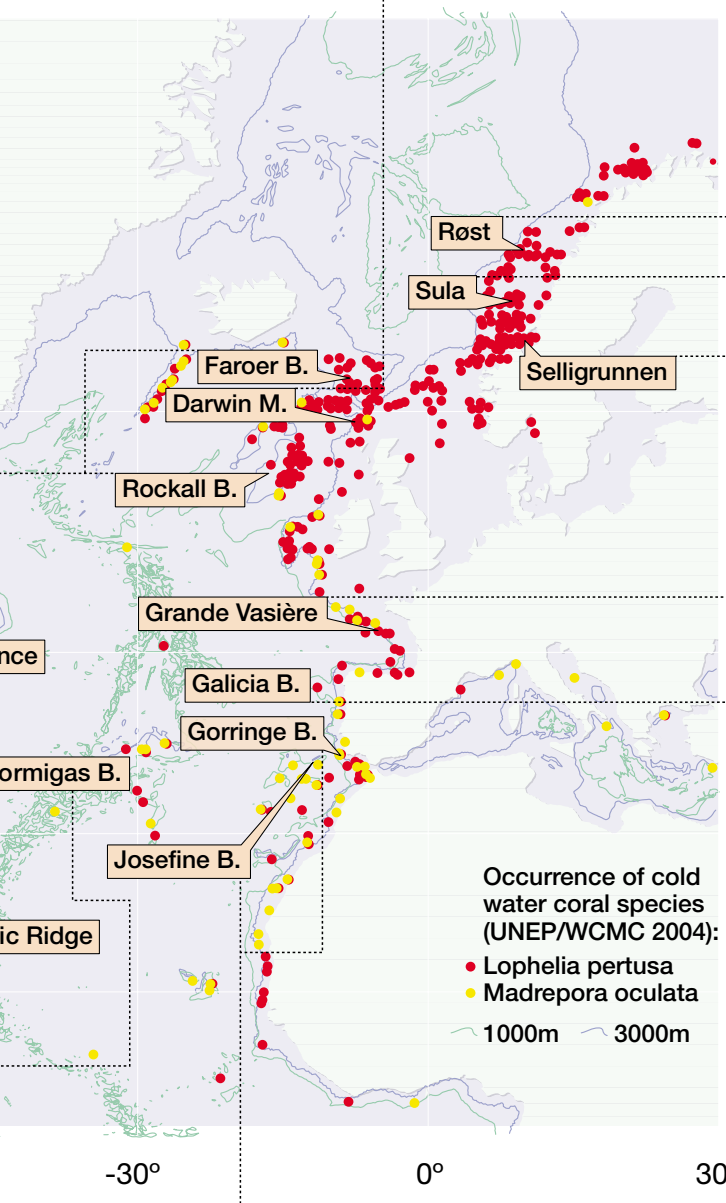
In Atlantic Canada, three coral areas have been extensively explored. Two large non-reef species seem to dominate. The pink bubblegum coral *Paragorgia arborea* and the tree-like seacorn coral *Primnoa resedaeformis* create huge coral forests in places. The **Northeast Channel** off Nova Scotia has the highest densities of coral and was protected by a fisheries closure in 2002. The **Gully** displays the highest diversity of coral species and was designated a MPA in 2004. The **Stone Fence** also contains a high diversity of coral species as well as the only known *Lophelia pertusa* reef in Canada.



At 60–110 metres' depth, off Florida's east coast, the **Oculina Banks** were discovered in 1975. The ivory tree coral *Oculina varicosae* is unique to this area, and was once found along 160 km of the continental shelf. Today, only a fraction is left. A large portion of the remaining coral area is closed to trawling and has been designated an MPA, where trawling, anchoring and commercial longline fishing are banned.

The **Formigas Bank**, north of the Azores, is a very shallow seamount and an important biodiversity sink as feeding ground, spawning and nursery area for many marine species. The vertical bedrock faces in the deeper areas support large colonies of black coral.

The **Darwin Mounds** are a unique collection of *Lophelia pertusa* coral thickets on top of hundreds of 100-metres wide and five-metres high “sand volcanoes”. They cover an area of approximately 100 sq km at 1,000 metres’ depth. These coral thickets support a wide diversity of life, including deep-sea fish. Since their discovery, WWF and others have highlighted the damaging effects of deep-water trawlers. In March 2004, the EU adopted a permanent ban on deep-water trawling in the area. Fishing with gillnets and longlines is still allowed and it will be important to monitor damage to the coral from these methods.



The Norwegian coast hosts a series of spectacular reefs, including the 35 metres high **Sula Reef**. As much as half of this reef was destroyed by trawling before being properly mapped. The **Røst Reef**, discovered in 2002, is the world’s largest known cold-water coral reef, 40 km long and covering a 100 sq km area. All deliberate destruction of coral reefs has been prohibited and bottom trawling banned in several reef areas. Norway has also established a marine protected area (MPA, see page 4) at the **Selligrunnen Reef**, the world’s shallowest *Lophelia* reef, prohibiting all human activities.

Le Massif Corallien de la Grande Vasière, off the French Atlantic coast, was described by scientists in the 1940s. It was then bordered by a massive and highly diverse coral reef on its northern side. Today, its status is uncertain. The greatest threat comes from bottom trawling. It is unprotected.

The **Galicia Bank**, site of the “Prestige” oil tanker disaster in 2002, is a very deep and steep seamount off northern Spain. Despite its proximity to the continental shelf, it hosts a significantly different fish community. *Lophelia pertusa* dominates the summit area. It has no protection.

The **Josefine Bank** and the **Gorringe Bank** are seamounts between Portugal and Madeira. The Josefine Bank hosts dense beds of especially soft corals and large sponges, making it distinctly different from other seamounts in the area, which host mostly hard corals. The shallower Gorringe Bank has large areas of hard surface supporting filter-feeding invertebrates, including coral, kelp beds and associated species communities.

Above: *Gorgon's head (Gorgonocephalus caputmedusae) in the Selligrunnen, a protected cold-water coral reef, Norway.*

Cold-water corals need urgent protection!

Cold-water corals are vital for fisheries and as biodiversity resources. They may also be key to the future development of pharmaceuticals for curing diseases such as cancer. Increased research and better management are urgently needed to protect these fragile and slow-growing habitats and their associated economic and biological value from being irrepairably damaged.

Protecting the coral is likely to have benefits beyond reef biodiversity. For example, protection of other habitat types across the world show that no-trawl zones help provide replenishment areas for important commercial fish stocks.

Individual cold-water coral areas are beginning to receive protection in waters under national jurisidiction. However, many coral reefs are located in the high seas (the 64% of oceans outside national jurisdiction), where the "freedom of the high seas" allows exploitation of natural resources. One of the most urgent tasks today is therefore to develop a globally agreed procedure, covered by international law, to protect biodiversity in these vast global commons.

Designating marine protected areas to conserve cold-water corals is one important tool to preserve and prevent further loss of cold-water corals and their associated wildlife. But to be effective, MPAs must be one component in a broader approach to the management of human activities in the marine environment. This is why WWF advocates the adoption and implementation of an ecosystem approach to the management of all marine activities and uses (see page 9). Alaska has taken such an integrated approach to its fisheries management and identified cold-water coral areas as a habitat of special concern. Protection measures include closures of large areas of coral and other important habitats to fisheries. This illustrates one proactive step that countries can take – given political will.

"MPAs must be one component in a broader approach"

Above: This sea anemone (Urticina eques) is one of many filter-feeding animals that live attached to hard surfaces in the north Atlantic.

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Above: Sea anemone (Urticina eques) and Gorgonia (Paramuricea) in the Selligrunnen, a protected cold-water coral reef, Norway.

'A thousand year-old reef can be crushed into oblivion by a single trawler in the course of a few hours'

The ecosystem approach – the key to a healthy sea

The ecosystem approach to management of human activities is based on an integrated, long-term vision of a healthy ecosystem that is shared by all stakeholders – fishermen, industry, environmental organisations, etc. By using this approach, human impacts on the environment can be minimised through a range of measures, such as direct controls of activities and spatial planning, including MPAs.

The ecosystem approach:

- is based on the precautionary principle – minimising the risk of damage to species and habitats, in particular when knowledge is scarce or non-existent
- balances the interests of all users of the sea against the vulnerability of the ecosystem and eventual requirements for recovery from previous impacts

Frameworks for action

Several important international and regional initiatives to protect and sustainably manage the marine environment have emerged in recent years. These agreements must now be developed, implemented and enforced to save one of our planet's most vulnerable habitats from being lost for ever.

A brief description of some of the most relevant international and regional initiatives and fora is given here.

The **United Nations Convention on the Law of the Sea (UNCLOS)** provides the global framework for ocean conservation and management of human activities. It obliges parties to protect and preserve the marine environment and rare and fragile ecosystems. It also states parties' duty to cooperate in conserving and managing marine living resources.

The **United Nations Fish Stocks Agreement** (1995) states that parties must minimise the impact of fishing on non-target species, protect habitats of special concern, protect marine biodiversity and apply the precautionary principle.

The Convention for Biological Diversity (CBD) aims to achieve by 2010 "a significant reduction in the current rate of biodiversity loss". At the **World Summit for Sustainable Development (WSSD)** in 2002, States also agreed to establish global networks of MPAs by 2012 and to implement the ecosystem approach to the management of human activities in the marine environment by 2010.

The 7th CBD Conference of Parties called on the UN General Assembly to act immediately and consider interim measures for the protection of cold-water corals and seamounts in areas beyond national jurisdiction.

Participants at the 5th **World Parks Congress** (2003) and the 4th Meeting of the **United Nations Open-ended informal consultative process on oceans and the law of the sea (UNICPOLOS)** (2003) re-emphasised the urgent need for improvement of the management of risks to seamounts and cold-water coral reefs, including areas beyond national jurisdiction.

The **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)** lists *Lophelia* species on Appendix II, thus regulating international trade in the species and ensuring that it is not detrimental to its survival.

The **EU Habitats Directive** (Council Directive 92/43/EEC on the conservation of natural habitiats and of wild flora and fauna) lists reefs, encompassing important cold-water coral, as a habitat type requiring protection by means of establishing Special Areas of Conservation (SACs) as part of a network of protected areas, known as the Natura 2000 network.

The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) has listed *Lophelia pertusa* reefs as a habitat in urgent need of protection. At the 2003 Convention meeting, Ministers declared that they were "…particularly concerned about the status of vulnerable cold-water coral reefs… We shall take immediate measures to protect coral reefs from further damage due to use of active fishing gear on the reefs. Furthermore, we shall ensure that steps are taken by 2005 to identify additional threats to the cold-water reefs and that measures are taken to protect the reefs against these threats."

Below: *Sealoch anemone (Protanthea simplex) in the Selligrunnen, a protected cold-water coral reef, Norway.*

Left: *White-bellied monkfish (Lophius piscatorius) is one of many commercially important fish species finding a refuge in coral areas.*

"...working hard to ensure the long-term future of the marine environment"

WWF works to protect cold-water coral

WWF is working hard to ensure the long-term future of the marine environment. In particular, WWF is collaborating with scientists who are establishing baseline information on the distribution and abundance of important centres of marine biodiversity, including cold-water corals, and working with decision-makers in a number of fora to ensure that national and regional sustainable management strategies complement specific conservation measures. WWF is also lobbying for the development of an international consensus for establishing and managing High Seas Marine Protected Areas, safeguarding the most outstanding biodiversity centres, including cold-water coral areas, from further damage.

In the north Atlantic, WWF is working towards:

- implementation of an effective ecosystem approach to management of human activities, on an appropriate spatial scale and including the assessment and mitigation of threats due to cumulative impacts
- establishing a network of MPAs to protect at least 60% of known cold-water coral habitat by 2010, including the designation of cold-water coral areas as Special Areas of Conservation (SACs) under the Habitats Directive in Europe
- implementation of proactive fisheries management measures by responsible authorities to minimise impacts and ensure the conservation of cold-water corals
- implementation of pro-active management measures covering oil and gas activities, including exclusion of oil and gas exploration and extraction, and the placement of pipelines, in the vicinity of reefs, particularly areas designated for protection
- the appropriate management of other activities, such as bioprospecting, the placement of communication cables and waste disposal, which may have a detrimental impact on cold-water corals and associated biodiversity

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:
– conserving the world's biological diversity
– ensuring that the use of renewable natural resources is sustainable
– promoting the reduction of pollution and wasteful consumption.

WWF's Global Marine Programme is the world's largest marine conservation programme, active in more than 50 countries around the world. WWF aims to restore the balance in the use of the oceans, and to secure a healthy marine environment for future generations.

WWF's Global Marine Programme has two targets:
– Within a generation, we aim to stop overfishing and ensure that all exploitation of fish populations comes from healthy and well-managed fisheries.
– WWF is also working to establish networks of well-managed and ecologically-representative marine protected areas covering at least 10% of the world's oceans, including the high seas.

WWF *for a living planet*®

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The material and the geographical designations in this report do not imply the expression of any opinion whatsoever on the part of WWF concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries.

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