

Conserving Habitats that Are Poorly Understood: Deepwater Corals and Efforts to Protect Them

Many parts of the ocean remain largely unknown to scientists. The deeper the water, the more difficult and costly it is to study the ecosystems there. Sometimes it is only exploration by commercial interests that sheds much light on the deep ocean, as the petroleum and fishing sectors plumb ever-greater depths with advanced drilling and fishing gear.

Such has been the case for deepwater corals. Although naturalists have known since the 1800s that some corals live in deep, cold water, researchers are only beginning to appreciate the scale of their reef communities, and their potential ecological significance to fish and biodiversity. As the petroleum and fishing industries increasingly encounter these reef communities off the coasts of Europe and elsewhere, resource managers are starting to consider necessary protection. This month, MPA News examines the current state of knowledge on deepwater corals, and the various efforts to protect them.

So much still to learn

It may surprise the layperson that some of the world's largest coral reefs, stretching several kilometers in length, exist in the northeast Atlantic, off the coasts of Norway and British Isles. There are records from the past century of fishing boats dredging up tons of coral from single trawls off Ireland. Existing deepwater corals in fished areas are remnants of what were likely much larger reefs.

The predominant coral species in the northeast Atlantic -- the hard, branching *Lophelia pertusa* -- prefers cold temperatures, thriving in waters between 4-12 degrees C. Unlike tropical corals, deepwater species hold no symbiotic relationship with photosynthesizing algae in order to survive; researchers believe they get their nutrients from filtered plankton or, perhaps, from seafloor hydrocarbon seeps. With no need for light, deepwater corals typically live between 100 and 2000 meters below the surface. They grow slowly -- living for hundreds of years -- and have been found in oceans around the world.

In the limited amount of research done to date on deepwater corals, more than 800 species of marine organisms -- including 23 species of fish -- have been recorded living on or in *Lophelia* reefs in the northeast Atlantic.

For scientists, the questions remaining on deepwater corals include ones as basic as documenting where they exist. Andre Freiwald of the University of Tuebingen (Germany) is coordinating the European Union-funded Atlantic Coral Ecosystem Study (ACES), the largest study of deepwater corals to date. The five-year project, now halfway done, will provide a baseline assessment of deepwater corals in the northeast Atlantic, and offer recommendations for future monitoring and management. To perform its research, the project is using submarines, robotic devices, and other high-tech tools. [The ACES website is <http://www.uni-tuebingen.de/geo/gpi/ag-freiwald/proj/aces>.]

"Conducting a large-scale assessment of a complex ecosystem on the high seas with a highly multidisciplinary team bears a broad suite of risks that can easily cause a major delay," said Freiwald. Nonetheless, ACES remains on schedule. By 2003, it will produce detailed maps on dimension, internal structure, and existing physical damage (such as from trawl activity). It will also produce data on oceanographic conditions that favor reefs, and a fuller species inventory. Lastly, the study will assign "sensitivity codes" to each reef area suggesting which sites might be most easily damaged by commercial exploitation in the area.

Recommending where to site MPAs

Anthony Grehan of the National University of Ireland is leading the policy side of ACES. He anticipates that the project will recommend designation of MPAs for some deepwater corals, and notes that the UK is already moving forward along this line. "The UK has agreed to declare the Darwin Mounds -- a UK offshore area where corals are being damaged by trawlers -- as the first offshore Special Area of Conservation under the European Union's Habitats Directive," he said. [Text of the Habitats Directive is at http://europa.eu.int/eur-lex/en/lif/dat/1992/en_392L0043.html.] In Ireland, an Irish Coral Task Force was set up last year to investigate allegations of trawl damage, and is now also working with ACES to protect reefs.

Where does this leave the fishing and petroleum industries? Trawlers may be most negatively affected by MPAs, particularly in the short term. Long-line fishermen, says Grehan, may benefit if they are allowed to continue fishing in coral areas. "Corals are an important source of structural complexity," he said. As such, he suggests, it is possible that the reefs serve as spawning areas for some species or provide refuge for juveniles of commercially important fish. In that case, by protecting the reefs, MPAs would theoretically protect the fisheries, too. As for the oil and gas industry, Grehan says its involvement with ACES will provide the industry with early notice of sensitive areas, which could save the sector money in the long run.

Freiwald says that when ACES has finished in 2003, it "will only have scratched the surface" in terms of knowledge about deepwater corals. Nonetheless, the project team is confident that its northeast Atlantic-based results will be applicable to other deepwater coral ecosystems in the world's oceans. "We are in close discussion with Canadian, Australian, and New Zealand marine research groups who intend to use our experience in planning their studies of deepwater coral ecosystems," said Freiwald.

Norway first to designate cold-water coral MPA

Last year, the Norwegian Directorate of Nature Management designated a small, 0.5-km² marine reserve to protect its Tautrarygg coral reef. It was the world's first MPA to protect cold-water coral. All potentially damaging activities -- including anchoring, dredging, laying of pipe, or sampling of coral or coral-affixed organisms -- are now banned at the site.

Located in a fjord, the Tautrarygg reef is the shallowest Lophelia reef known, with parts of the reef existing only 40 meters below the surface. Popular with divers, the reef has sustained damage over the years, primarily from anchors and from scientists' gathering of coral samples.

"Lophelia localities within fjords are much smaller than those on the continental shelf," said Ingrid Mjølnerod, advisor to the Directorate of Nature Management. On Norway's continental shelf is the largest Lophelia reef known in the world -- the Sula reef. It measures 13 kilometers long, about 750 meters wide, and covers nearly 1000 km². Norway's somewhat smaller Iver reef, also on the continental shelf, covers more than 620 km².

Facing fishing pressure, both reefs were closed to bottom trawling within the past two years by the national Directorate of Fisheries. Fishing in the water column above the reefs is still allowed. The Norwegian Institute of Marine Research estimates that about half of Norway's coral reefs have been partially or completely destroyed by trawling.

Mjølnerod points out that the Sula and Iver reefs are so far protected only by fisheries legislation, not by formal MPA legislation. "We find that is most appropriate since fishing activity is the immediate threat, and we believe that fishermen are more likely to obey their 'own' legislation than ours." Her directorate continues to examine other areas for potential MPA designation. "We have finalized a list of 47 proposed marine protected areas along our coast," she said. "Several of these are coral localities, so hopefully we will have more corals protected by 2004."

The state oil company of Norway, Statoil, has played a major role in research on the country's deepwater corals. It is credited with discovering the Sula reef during an investigation of where to site pipelines along the west coast of the country. Most of the mapping done of Lophelia in Norwegian waters has come about through similar pipeline-related projects.

Canadian fishermen working to protect corals

On the east coast of Canada, where depleted fish stocks have depressed the region's fishing-based economy for years, two fishermen have helped lead efforts to protect the country's deepwater corals. Derek Jones and Sanford Atwood -- both hook-and-line fishermen by trade -- now spend their time educating the public about deepwater corals and lobbying government scientists and fishermen to stop the practices of trawling and dredging in coral areas.

"The biggest challenges to the protection of cold-water corals is the lack of accountability of government policy and the lack of public knowledge of the coral habitats," said Jones.

Jones and Atwood co-founded the Canadian Ocean Habitat Protection Society, an NGO that now operates a museum devoted to deepwater coral science and education. The museum displays specimens collected by the fishermen and provides research evidence of what they see as a link between healthy coral habitats and healthy fisheries. "Corals are the ultimate fish habitat -- especially hard corals -- and fishermen have acknowledged this for generations," said Jones.

He, Atwood, and a group of scientists, conservationists and longline fishermen are now championing the idea of an MPA designated in the "Hell Hole", a high-energy deepwater environment off the southern tip of Nova Scotia. The 500-km² site contains relatively undisturbed corals, and is also home to giant halibut and marine mammals.

For more information

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