

Sink or swim

Can an ambitious plan to protect unique marine habitats in the open ocean turn the tide of destruction? Henry Nicholls plunges in.

Peering through the thick glass windows of their submersible, the ocean scientists were greeted by a sight no one on Earth had ever seen before. In front of them, smoking towers of deep-sea hydrothermal vents teemed improbably with creatures, including giant tube worms and yellow mussels. As the crew of the research vessel *Alvin* stared in wonder, it probably didn't occur to them that this newly discovered biodiversity at the bottom of the ocean might one day need to be protected from people. But that was 1977, and it is now time for a reassessment.

Conservation biologists generally agree that unique habitats in the open sea such as hydrothermal vents, seamounts and cold-water reefs require urgent protection. Fishing, pollution and commercial traffic in international waters — known in treaties as the 'high seas' — have increased to such an extent that ecosystems once deemed out of human reach are feeling the effects.

Two years ago, delegates at the World Summit on Sustainable Development in Johannesburg, South Africa, agreed to establish by 2012 a network of marine reserves representing all major habitats, both within and beyond national jurisdiction. In February,

this target was incorporated into the Convention on Biological Diversity, which has so far been ratified by 188 countries. Conservation biologists are pushing for the first marine parks to be in place by 2008.

But a number of obstacles stand in the way. Uncertainty about which habitats to protect, opposition from the fishing industry, legal loopholes and the challenges of enforcing marine reserves far from land are making the targets hard to meet. Nor has there been any agreement on how, or by whom, the reserves would be run. Such hurdles are likely to dominate discussions of ocean protection at the World Conservation Congress in Bangkok, Thailand, over 17–25 November.

Much of the biodiversity in the high seas has come to light only in the past three decades. As well as hydrothermal vents, there are deep-ocean trenches, crevices that plunge to more than 10 kilometres below sea level and play host to deep-sea molluscs and scavenging crabs. Dotting the ocean floor are thousands of seamounts, extinct submarine volcanoes, each of which harbours a unique ecosystem. And some of the most abundant life in the ocean is found on cold-water reefs, delicate coral systems that grow in chilly, nutrient-rich waters.



In a bind: fishing nets can be lethal to marine mammals like this sperm whale.



Grand Banks

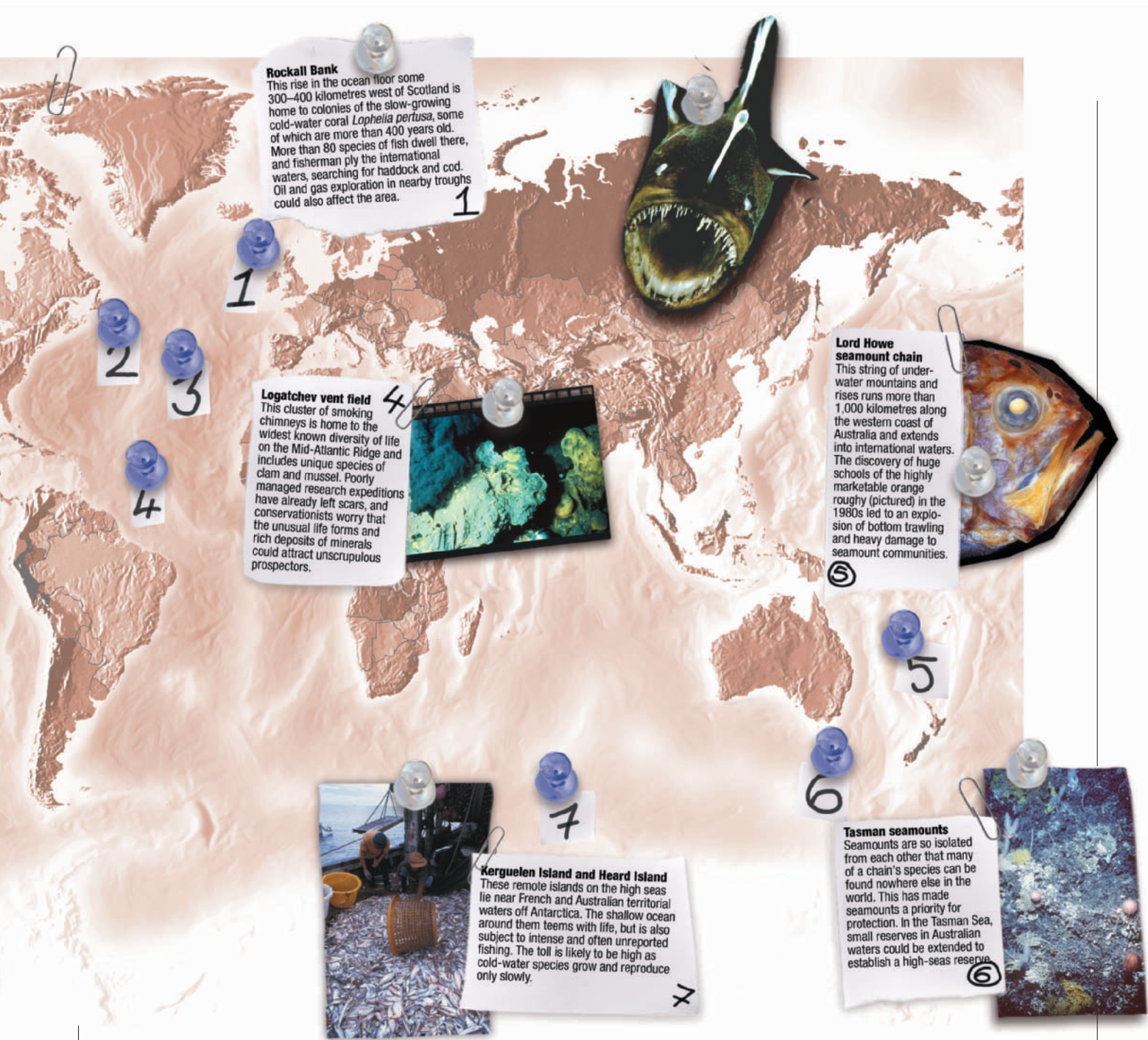
Once home to huge schools of cod, the Grand Banks off Newfoundland have been continually fished since the fifteenth century. Although heavily reduced, cod and flounder stocks have begun a gradual recovery since the banks were closed to most fishing in 1995. Many see the 10% of the area that lies in international waters as a good candidate for a high-seas reserve. 2

Rainbow vent field

Located just 350 kilometres southwest of the Azores, this field has more potential than other sites for exploitation by miners and bioprospectors — and even tour operators promising glimpses of deep sea creatures such as this newly discovered *Promachoteuthis*. But that proximity to land also makes it easier to police. 3

Despite decades of exploration, the species count continues to grow — each marine survey nets a menagerie of new life forms. One, conducted earlier this year by the Norwegian-led MAR-ECO expedition along the deep-sea ridges in the mid-Atlantic, turned up a new species of anglerfish and a new squid with an unusually small head and tiny eyes.

Even the open ocean — once assumed to be the marine equivalent of a desert, visited only by migrating animals such as tuna, turtles and whales — harbours a wealth of microscopic biodiversity. Last year, a single cupful of the Sargasso Sea near Bermuda was found to contain at least 1,800 new microbial species bearing more than one million previously unknown genes¹.



Rockall Bank

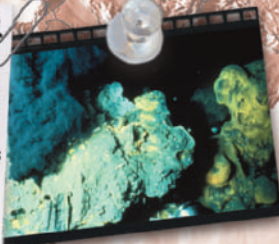
This rise in the ocean floor some 300–400 kilometres west of Scotland is home to colonies of the slow-growing cold-water coral *Lophelia pertusa*, some of which are more than 400 years old. More than 80 species of fish dwell there, and fishermen ply the international waters, searching for haddock and cod. Oil and gas exploration in nearby troughs could also affect the area.

1

Logatchev vent field

This cluster of smoking chimneys is home to the widest known diversity of life on the Mid-Atlantic Ridge and includes unique species of clam and mussel. Poorly managed research expeditions have already left scars, and conservationists worry that the unusual life forms and rich deposits of minerals could attract unscrupulous prospectors.

4



Lord Howe seamount chain

This string of underwater mountains and rises runs more than 1,000 kilometres along the western coast of Australia and extends into international waters. The discovery of huge schools of the highly marketable orange roughy (pictured) in the 1980s led to an explosion of bottom trawling and heavy damage to seamount communities.

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7

Kerguelen Island and Heard Island

These remote islands on the high seas lie near French and Australian territorial waters off Antarctica. The shallow ocean around them teems with life, but is also subject to intense and often unreported fishing. The toll is likely to be high as cold-water species grow and reproduce only slowly.

7



Tasman seamounts

Seamounts are so isolated from each other that many of a chain's species can be found nowhere else in the world. This has made seamounts a priority for protection. In the Tasman Sea, small reserves in Australian waters could be extended to establish a high-seas reserve.

6



Park life: marine conservationists say protection is needed for sites such as these, which exemplify a range of habitats and deep-sea organisms.

“The biodiversity of the high seas is indeterminate, but it’s immense,” says Graeme Kelleher, who heads the high-seas task force for the World Commission on Protected Areas, the body that is coordinating protection efforts for the high-seas. Kelleher reckons that there are enough new discoveries each year to increase the estimate of biodiversity in the sea nearly tenfold. “It’s not only the last great ecological frontier, but also probably the world’s richest biodiversity frontier,” he says.

But the high-seas habitats that are home to these organisms are being damaged. One of the main culprits is deep-sea bottom trawling, a widespread fishing practice that involves dragging weighted nets across the tops of seamounts, some 500 to 2,000 metres

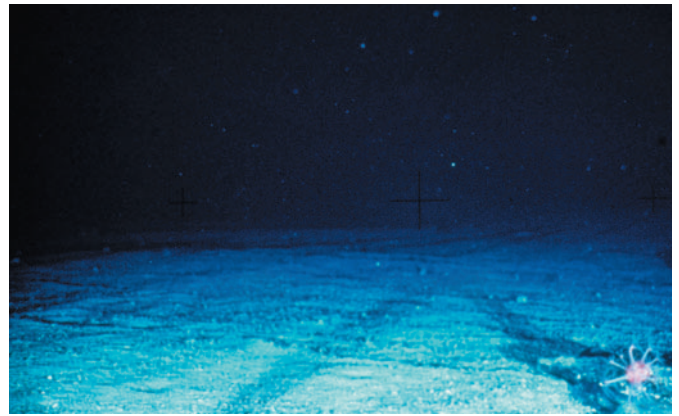
below the surface. This reduces cold-water coral reefs to rubble and decimates populations on seamounts.

In the zone

So far, marine protection has largely been limited to habitats near the coast. There are about 4,000 marine reserves within the 370-kilometre Exclusive Economic Zones (EEZs) of coastal nations, where activities such as shipping, fishing and recreational boating are restricted. In such reserves, a given country’s jurisdiction provides a legal framework for protection and enforcement. Yet taken together, these reserves account for less than 0.5% of the ocean’s surface. To date, there is still not a single protected area in the high seas.

Part of the difficulty is that these international waters are traditionally as open and free as the Wild West once was. That principle was made explicit in 1958 in the Convention on the High Seas, which preserved the right of all nations to exploit high-seas resources. This was superseded in 1982 by the UN Convention on the Law of the Sea, which established the conservation of marine resources as a duty of nations in principle. But without specific protection schemes, such as catch limitation, the agreement has done little to curb the intensive use of the ocean.

Although the Johannesburg meeting and the Convention on Biological Diversity set 2012 as the target date for establishing high-seas marine parks, neither specified the



Deeply damaged: fishing vessels (left) out to catch deep-sea fish such as pollack can cause serious damage to seamounts with their trawls (right).

number of areas or the expanse of ocean they should cover. Instead, the agreements called for reserves that are “representative” of all major marine habitats. This has left governments and conservation groups arguing over what the 2012 target actually means and what steps are needed to meet it.

Some guidance came from the World Parks Congress, which met last year in Durban, South Africa. There, conservation biologists agreed that at least five high-seas marine parks must be in place by 2008 if the 2012 target is to be met. Several possible sites (see graphic on pages 12–13) have been identified that could be protected by extending existing marine laws, says Kristina Gjerde, high-seas policy adviser to the World Conservation Union’s marine programme.

The legal backbone could come, for example, from the United Nations Fish Stocks Agreement, which came into force in 2001 and aims to reduce the exploitation of ‘straddling’ fish — those that cross between the high seas and EEZs — and highly migratory species such as tuna. But this is only a partial solution, as several key fishing states have yet to ratify the agreement. Furthermore, it does not contain provisions for protecting local concentrations of biodiversity that are neither straddling nor migratory, such as those living on seamounts. And in any case, fishing vessels can dodge such laws simply by registering in a country that has not signed up to them.

The right angle

Efforts to close these legal loopholes are under way, but diplomatic hurdles remain. At an informal meeting to discuss ocean issues in June, a proposal for the UN General Assembly to consider the legal framework necessary for marine parks to become a reality was thwarted by opposition from several countries, including big fishing nations such as Japan, South Korea and Iceland, says Gjerde. But if the World Conservation Union throws its weight behind the proposals for high-seas protection at the

forthcoming Bangkok meeting, the chances are that the General Assembly will address the issue this year or next, she says.

Seeking a stopgap until marine parks can be established, an umbrella group of conservation organizations called the Deep Sea Conservation Coalition is pressuring the UN to declare a moratorium on bottom trawling. On 7 October, Costa Rica formally proposed incorporating such a moratorium into the fisheries and oceans resolutions that the General Assembly passes each year. A decision is expected on 16 November.

The fishing industry is expected to fight such measures. It argues that current practices are sustainable, and that further restrictions would only harm the economies of countries that depend heavily on fishing.

Yet two-thirds of fisheries are already being fished to the fullest sustainable extent or beyond, according to UN data. And conservationists argue that fisheries actually benefit from restrictions in the long run, because marine reserves improve fish stocks both within and beyond protected areas.

Off St Lucia in the Caribbean, for instance, catches of reef fish near protected areas almost doubled within five years, says Callum Roberts, a marine conservationist at the University of York, UK². Clam fisheries in Fiji are also improving because of nearby protected areas³. “Fijian villagers now report seeing clams that are larger than they’ve seen for three generations,” Roberts says. Industrial fisheries may also benefit. For example, in 1994 a quarter of the Georges Bank near the New England coast was put off-limits to scallop dredging and trawling. Compared with the fished area, the protected area now contains about ten times as many full-sized scallops⁴.

Such benefits suggest that the costs of creating marine reserves could be offset in the long term by reducing subsidies to fishing fleets as catch numbers rise. A survey of reserves by Roberts and his colleagues suggests that a network protecting 20–30% of the ocean would cost between US\$5 billion

and US\$19 billion to run⁵. Today, subsidies to the fishing industry range between \$15 billion and \$30 billion, Roberts estimates.

But even if a legal framework can be put in place by 2012, the fisheries brought on board and funding found, there is still the problem of how to police protected areas on the high seas.

Great scheme

Technology may provide part of the answer. On Australia’s Great Barrier Reef — widely recognized as a model marine protected area — all boats must be equipped with satellite navigation systems and transmitters. These devices tell skippers which of six different zones they are sailing through and hence what activities are permitted. They simultaneously transmit to park authorities the precise location of the vessel.

The system has performed well, even under duress, says Kelleher. At the beginning of July, the ‘no-take zone’ — where all fishing is prohibited — expanded from less than 5% to a third of the protected area with no significant problems. But there is little doubt that such a system would be much harder to operate on the high seas, not least because a larger area much farther from shore would have to be patrolled to spot any vessels that were not fitted with transmitters.

With so many complicating factors, few are willing to make a firm prediction on whether the 2012 target can be met. Daniel Pauly, a leading fisheries biologist and director of the Fisheries Centre at the University of British Columbia in Vancouver, Canada, says that the biggest factor is likely to be how much pressure conservation groups can exert on the UN and on individual nations. “It will depend on political will,” he says.

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