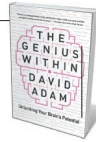


COMMENT

EARTH SCIENCE A geologist looks for answers among the oldest rocks on Earth **p.166**

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WATERFRAME/ALAMY



A floating forest of *Sargassum* seaweed in the Sargasso Sea provides food and shelter for hatchling loggerhead sea turtles in the Atlantic Ocean.

Protect the neglected half of our blue planet

Maintaining momentum is crucial as nations build a treaty to safeguard the high seas, argue **Glen Wright, Julien Rochette, Kristina M. Gjerde and Lisa A. Levin.**

At the close of 2017, 14 million UK viewers tuned into the acclaimed second series of David Attenborough's *Blue Planet*, making it the year's most-watched television show. It brought the wonders of the ocean into people's living rooms and captured the public imagination as never before. Now is the time to capitalize on this enthusiasm, and to advocate for strong, legally binding protections for the high seas — the almost two-thirds of our planet's ocean that are beyond the control of any one state (see 'Neglected waters').

A start has been made. A landmark resolution was adopted at the United Nations General Assembly on 24 December 2017, marking the beginning of formal diplomatic negotiations for an international treaty to conserve and sustainably use the high seas. Co-sponsored by more than 130 nations, Resolution 72/249 is the result of more than a decade of scientific debates, legal controversies and political wrangling¹. The decision paves the way for a range of measures, including a much-needed system of global marine protected areas (MPAs) to sustain

aquatic life in a rapidly changing ocean.

Now we must ensure that real progress is made over the next few years. The treaty, expected some time after 2020, will need to include provisions for firm international oversight and direction if it is to have any chance of overcoming problems with the existing regulatory framework. As with any such negotiations, there is a risk that they will result in a toothless call for 'urgent' action and increased cooperation.

Non-governmental organizations and environmental groups will continue to ►

► push for strong conservation measures, including strictly protected reserves. The research community can contribute by speeding up the collection of baseline data to characterize existing environments and biodiversity; coordinating observation efforts across disciplines; monitoring and assessing ocean health; and further studying how MPAs and other conservation tools work on the high seas. Indeed, ocean science could be a unifying focus for this new agreement². Social scientists, legal scholars and other experts can feed the negotiations with pragmatic options.

Together, we must advocate for a strong international treaty if crucial high-seas ecosystems are to survive and thrive.

PATCHY PROTECTION

Governments have repeatedly made high-level political commitments to conserve marine biodiversity. The Aichi Biodiversity Targets and the UN Sustainable Development Goals, for example, demand protection of 10% of the world's ocean (although some scientists argue that at least 30% is necessary³). This is to preserve wild spaces, sustain fisheries, protect the ecosystems that regulate the climate and preserve a wealth of biodiversity⁴. Governments have nonetheless been slow to act. Just 4% of the ocean is currently protected, and hardly any MPAs cover the high seas⁵.

Marine areas beyond national jurisdiction are regulated by a patchwork of different agreements and institutions, each with their own peculiarities and pitfalls. Most of these organizations focus on the management of a particular resource or activity. The International Seabed Authority (ISA) oversees seabed mining. Regional fisheries-management organizations regulate high-seas fisheries. And the International Maritime Organization sets out shipping rules.

There are few channels of communication between these agencies, much less formal cooperation or coherence between their management measures. Their decisions are highly politicized, and the need to reach consensus among member countries can trump scientific evidence.

Some regional initiatives have made limited progress. The OSPAR Commission, named after its original conventions in Oslo and Paris, is composed of 15 countries and the European Union. It has designated ten MPAs in the high seas of the northeast Atlantic. However, these apply only to its member countries, and OSPAR does not have the authority to regulate many activities or to ensure that conservation is part of fisheries decisions.

In 2017, the ISA approved a 15-year exploration contract with Poland, covering part of the Mid-Atlantic Ridge. Within this OSPAR area sits the Lost City hydrothermal

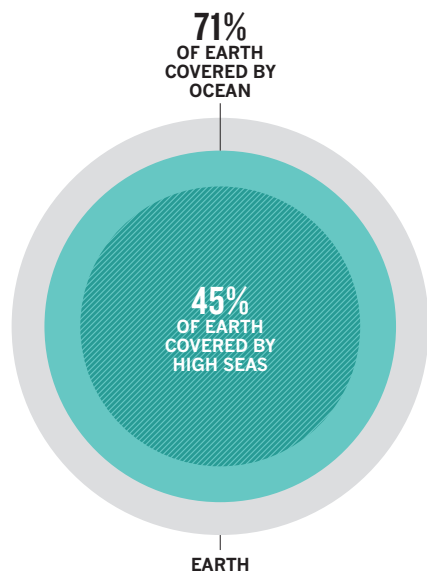
field, a unique range of 60-metre-tall calcium carbonate chimneys. The UN Educational, Scientific and Cultural Organization (UNESCO) and the International Union for Conservation of Nature (IUCN) have highlighted that the site might meet the criteria for World Heritage status⁶. The ISA did not consult UNESCO, the IUCN or OSPAR, which left scientists who study this feature with no avenue for input other than writing a letter of concern after the contract was approved.

On the other side of the Atlantic, the Sargasso Sea Commission is attempting to protect a unique floating forest of *Sargassum* seaweed — recognized as an Ecologically or Biologically Significant Marine Area (EBSA) under the Convention on Biological Diversity. This recognition does not entail any management measures, and only one of the few regulatory bodies in this high-seas region has shown an interest in implementing any.

In the Southern Ocean, countries have worked together within the dedicated Antarctic Treaty System to designate part of the Ross Sea as the world's largest MPA (1,549,000 square kilometres). This required

NEGLECTED WATERS

Almost two-thirds of the planet's ocean are classed as international waters or high seas, meaning that they are beyond the control of any one state.



intense diplomatic efforts. Nonetheless, the resulting protections are limited, and the process to establish more MPAs recently stalled.

CONSERVE AND CONNECT

Research has shown that MPAs are effective if they are done right. Large, long-term, 'no-take' reserves that are isolated by deep water or sand and backed up with strong enforcement have five times more large-fish biomass than unprotected areas⁷.

Recent advances have greatly improved the evidence base for MPAs on the high seas, dispelling many common assumptions about their feasibility and efficacy⁸. For example, scientists previously thought that species ranges were too big to designate meaningful MPAs, but we now know that even wide-ranging deep-water species assemble to feed and spawn, and use particular habitats for nurseries⁹. So strategically protecting just part of a species' range could help to sustain populations^{10,11}.

It is easy to find candidates for an initial suite of MPAs. UNESCO has identified 5 possible high-seas World Heritage Sites; nearly 50 EBSAs cover portions of the high seas; fisheries bodies, following requirements in UN resolutions, have identified 'vulnerable marine ecosystems' susceptible to impacts from bottom trawling; and the ISA is identifying 'areas of particular environmental interest'. These designations cover a broad range of habitats, from deep-water coral grounds to abyssal plains, and are grounded in scientific criteria — including a site's uniqueness, productivity, complexity and fragility.

Protecting such sites is a start, but will not insure the ocean against the many threats it faces. A wider network of representative and connected MPAs will be needed to provide resilience to climate change and to maintain biodiversity by ensuring links between migration routes and spawning grounds¹². No one has worked out where, how large or how deep these areas should be. Complementary measures and better management will also be needed for the ecosystems and activities that fall outside MPAs.

Calling for protection of a swathe of the high seas might seem starry-eyed. But some have made the case for entirely closing the high seas to fishing, arguing that this would lead to greatly increased fisheries yields and profits overall¹³.

More research will be required if we are to protect these deep and distant seas effectively. Ramping up basic research efforts to improve baseline data is crucial, as is improving our understanding of how climate change and other stressors affect invaluable ecosystem services. We will need to better coordinate and expand existing observation programmes, improve data access and promote training for young scientists. Next-generation molecular, computing, telemetry and observing technologies must also be developed and applied.

Some progress is being made here: researchers are developing techniques for growing deep-sea organisms in the laboratory, shedding light on their reproductive traits and biology. The UN has declared 2021–30 as the Decade of Ocean Science for Sustainable Development. This should help to mobilize the scientific community around these issues.



Great white sharks (*Carcharodon carcharias*) often visit an area of the Pacific Ocean dubbed the White Shark Café. It is one of five areas proposed as a high-seas World Heritage Site.

DAVID FLEETHAM/BARCROFT/GETTY

The questions of who will designate MPAs and how management measures will be implemented are politically charged. The strongest possible outcome of the upcoming treaty negotiations, from a legal perspective, would be a new UN body with wide powers to make binding, top-down decisions, working in concert with existing organizations. At the other end of the spectrum, states could be left to cobble together MPAs within the existing system, with the new agreement providing some form of obligation and oversight. The former would provide a powerful means of protecting this important global commons; the latter might leave conservation beholden to the failings of the current framework, with states likely to continue dragging their feet.

A balance will need to be found. To be effective, the new instrument must provide sufficient international oversight, while respecting the mandates of existing organizations and ensuring that a majority of states is prepared to sign up.

What is certain is that individual states will remain responsible for controlling ships flying their flag. Proactive states could therefore agree to work collectively through the new treaty to protect priority places by controlling the biodiversity impacts of their vessels, while encouraging non-parties to do the same. However, the negotiations are not intended to address 'flags of convenience', whereby a country registers vessels on a 'no questions asked' basis, generally in exchange for a fee.

GENETIC GOLDMINE

Marine protection is only one part of the treaty discussions. The question of how to regulate the exploitation of marine genetic resources also promises to be both technically and politically challenging.

Genes extracted from marine creatures in the high seas are being used to develop new pharmaceuticals and cosmetics. There is currently no requirement to share the profits that arise from the exploitation of this common resource.

The few states that have the capacity to conduct bioprospecting are keen to maintain the status quo, which is essentially first come, first served. Others want to create a formal mechanism for sharing the profits, similar to a system already being put in place for seabed mining. The long and complicated chain of discovery makes it difficult to capture any monetary benefits. And the distinction between bioprospecting and 'pure' scientific research, which is permitted by the UN Convention on the Law of the Sea, is often far from clear.

Researchers can help here, too, such as by improving open-access protocols for data and samples. Even in the absence of a comprehensive regulatory framework or an obligation to share profits, a new treaty could still include helpful provisions that would

"Turning good intentions into an effective treaty will take time, money and scientific input."

promote international science cooperation, capacity building and the development and transfer of marine technology¹⁴.

Turning good intentions into an effective treaty with meaningful MPAs will take time, money and scientific input. There is uncertainty regarding the position and role of the United States, which has not ratified the UN Convention on the Law of the Sea. Developing countries are calling for greater assistance, which will require developed nations to commit considerable resources. But with the majority of countries now in favour of a new agreement, momentum is building.

Tough diplomatic negotiations might nonetheless be necessary to reach consensus on the finer details of the new treaty. The beauty and value of our ocean could be lost all too easily in the windowless halls of the UN's New York headquarters, obfuscated by realpolitik and the arcane details of international law. Political leaders will need to see strong science and public support if they are to develop an ambitious agreement to finally protect the neglected half of our blue planet. ■

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