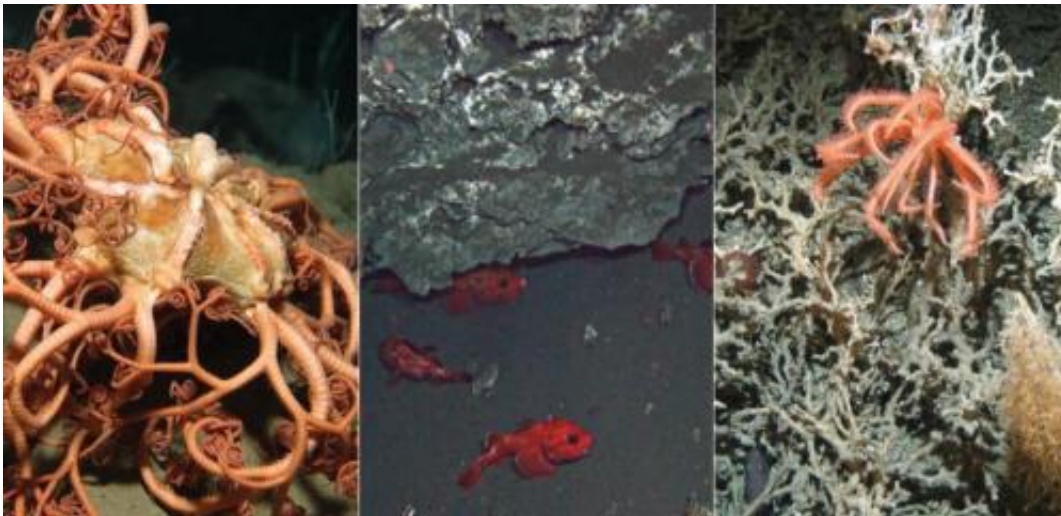


From 'Finding Nemo' to minerals—what riches lie in the deep sea?

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Left: The first species ever recovered from the deep sea. Center: Rockfish use deep-sea carbonate formations at Hydrate Ridge, US, as a refuge. Right: Deep-sea corals such as the one pictured are a source of jewelery and other riches. Credit: SERPENT Project/D.O.B. Jones, L. Levin, UK's BIS Department

As fishing and the harvesting of metals, gas and oil have expanded deeper and deeper into the ocean, scientists are drawing attention to the services provided by the deep sea, the world's largest environment. "This is the time to discuss deep-sea stewardship before exploitation is too much farther underway," says lead-author Andrew Thurber. In a review published today in *Biogeosciences*, a journal of the European Geosciences Union (EGU), Thurber and colleagues summarise what this

habitat provides to humans, and emphasise the need to protect it.

"The [deep sea](#) realm is so distant, but affects us in so many ways. That's where the passion lies: to tell everyone what's down there and that we still have a lot to explore," says co-author Jeroen Ingels of Plymouth Marine Laboratory in the UK.

"What we know highlights that it provides much directly to society," says Thurber, a researcher at the College of Earth, Ocean and Atmospheric Sciences at Oregon State University in the US. Yet, the deep sea is facing impacts from climate change and, as resources are depleted elsewhere, is being increasingly exploited by humans for food, energy and metals like gold and silver.

"We felt we had to do something," says Ingels. "We all felt passionate about placing the deep sea in a relevant context and found that there was little out there aimed at explaining what the deep sea does for us to a broad audience that includes scientists, the non-specialists and ultimately the policy makers. There was a gap to be filled. So we said: 'Let's just make this happen'."

In the review of over 200 scientific papers, the international team of researchers points out how vital the deep sea is to support our current way of life. It nurtures fish stocks, serves as a dumping ground for our waste, and is a massive reserve of oil, gas, precious metals and the rare minerals we use in modern electronics, such as cell phones and hybrid-car batteries. Further, [hydrothermal vents](#) and other deep-sea environments host life forms, from bacteria to sponges, that are a source of new antibiotics and anti-cancer chemicals. It also has a cultural value, with its strange species and untouched habitats inspiring books and films from 20,000 Leagues Under the Sea to Finding Nemo.

"From jewellery to oil and gas and future potential energy reserves as

well as novel pharmaceuticals, deep-sea's worth should be recognised so that, as we decide how to use it more in the future, we do not inhibit or lose the services that it already provides," says Thurber.

The deep sea (ocean areas deeper than 200m) represents 98.5% of the volume of our planet that is hospitable to animals. It has received less attention than other environments because it is vast, dark and remote, and much of it is inaccessible to humans. But it has important global functions. In the Biogeosciences review the team shows that deep-sea marine life plays a crucial role in absorbing carbon dioxide from the atmosphere, as well as methane that occasionally leaks from under the seafloor. In doing so, the deep ocean has limited much of the effects of [climate change](#).

This type of process occurs over a vast area and at a slow rate. Thurber gives other examples: manganese nodules, deep-sea sources of nickel, copper, cobalt and rare earth minerals, take centuries or longer to form and are not renewable. Likewise, slow-growing and long-lived species of fish and coral in the deep sea are more susceptible to overfishing. "This means that a different approach needs to be taken as we start harvesting the resources within it."

By highlighting the importance of the deep sea and identifying the traits that differentiate this environment from others, the researchers hope to provide the tools for effective and sustainable management of this habitat.

"This study is one of the steps in making sure that the benefits of the deep sea are understood by those who are trying to, or beginning to, regulate its resources," concludes Thurber. "We ultimately hope that it will be a useful tool for policy makers."

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