

DEEP SEA MINING THREATENS OCEAN HEALTH AND FISHERIES

By Julian Jackson

Although researchers still have much to learn about the deep sea and its huge reservoir of dazzling and valuable biodiversity, they already know enough to warn that mining the deep seabed for minerals could inflict irreversible damage on this highly sensitive ecosystem and cause far-reaching harm that people are only beginning to understand. For example, climate models suggest that highly migratory fish stocks are progressively shifting toward areas currently being prospected for mining, setting the stage for potential conflict between fishing and seabed mining stakeholders. This is just one of many unresolved problems illustrating that the world is not ready to open the deep sea to mining.



Credit: Kanenori on Pixabay

There is significant geographic overlap between prospective seabed mining areas and fishery stocks across the global ocean.

The deep sea and seabed are irreplaceable, home to complex and vulnerable ecosystems, and an array of life, much of it yet to be identified by science. But for nearly two decades, a number of governments and businesses have been working to open the deep seabed to mining in international waters. These proponents say that the deposits of cobalt, nickel, manganese and lithium on and beneath the seafloor could help supply industries ranging from those that produce smartphones to ones that manufacture electric vehicle batteries. They further argue that deep-seabed mining would have only a negligible impact on marine life.

But a growing body of science suggests that optimism is misplaced, and that mining could threaten not only biodiversity but also industries reliant on living marine resources, such as fishing. A study published in the journal *Nature* in July 2023 found high potential for climate disruption to drive numerous species of commercially fished tuna into an area of the Pacific Ocean where extensive mining is being planned. Mining this area could lead to adverse effects on marine life and economic harm. Sediment plumes and other related consequences from mining potentially risk disrupting tuna feeding and reproduction patterns and might increase the population's exposure to toxic metals which accumulate and make their way to consumers. The authors found that sediment plumes from mining could also reduce visibility and increase tunas' stress hormone levels.

Other challenges raised by seabed mining include noise and artificial light, which can interrupt communication, navigation and other behaviour patterns among marine life within a naturally dark and silent environment. There's also the fact that some deep sea species – such as the Greenland shark and many types of coral – live extremely long lives by human standards and take decades to reach reproductive age, which means that they are vulnerable to being severely endangered or wiped out entirely by sustained mining activity.

In response, the Global Tuna Alliance and other seafood industry groups have joined some governments and major companies in calling for a moratorium or precautionary pause on deep sea exploitation activity.

Experts say that all manner of deep sea ecosystems being targeted for seabed mining could take centuries to recover from significant damage – if they're able to rebound at all. The three main types of mineral resources (see map on the next page) include seafloor massive sulfides found in hydrothermal vents, which are essentially underwater hot springs where volcanic magma swells into the freezing depths of the ocean; cobalt-rich crusts occurring on underwater mountains, known as seamounts, that rise hundreds or thousands of feet from the seafloor; and polymetallic nodules, potato-sized formations that contain manganese, nickel, copper and cobalt and are concentrated on the abyssal plains, which are large, flat expanses covering the deep ocean floor.

It's these nodules that mining companies and governments are currently seeking. The nodules took millions of years to form, and it's unclear how removing them *en masse* would affect the ecosystem. Even as miners advance their plans, there are no rules in place to protect the marine environment, which is one of the obligations of the International Seabed Authority (ISA), an entity created under the United Nations Convention on the Law of the Sea (UNCLOS) to govern deep sea mining in international waters.

There's also a lack of information on the risks mining could pose to fisheries. For example, scientists have very little understanding of how mining might affect the water column where fish live. And perhaps most glaring, the ISA has not included the fishing sector as an active stakeholder in negotiations on mining regulations. This must change.

How we got here

In the 1970s, when countries were drafting UNCLOS, the prevailing assumption was that the deep sea lacked significant signs of life. But the countries anticipated risks to the marine environment from mining, so the ISA was mandated to create rules and regulations to ensure "the effective protection of the marine environment from harmful effects that may arise from deep-seabed-related activities."

As a push to allow deep-seabed mining increased, the ISA in 2016 began facilitating multilateral negotiations to develop a regulatory framework for the activity and in 2019 published draft regulations. But almost a decade later, ISA Member States have been unable to finalize those regulations. This is because fundamental aspects of the regulatory regime remain incomplete, and as The Pew Charitable Trusts and other groups have pointed out, the draft rules [have at least 30 major outstanding policy issues](#). These include a lack of consensus on how to assess the effects of mining, what amount of environmental harm can be allowed, and how to enforce the regulations once they are in place. Additionally, ISA Member States have not yet fully considered a range of additional subsidiary rules that are mandated to be adopted with the main regulations and would cover topics such as how to consult countries and other stakeholders, like the fishing industry, that could be affected by mining – a docket that will likely require extensive debate and may take several years to complete.

When the regulatory framework is finalized, it must still be implemented effectively. Currently, the ISA functions as an international organization focused on seabed exploration and prospecting as well as facilitating multilateral negotiations on how to govern mineral resources. It is not equipped to simultaneously act as licensor, regulator, and royalty receiver and distributor. Those responsibilities are typically performed in national settings by highly specialized bodies. And the complexities of mining occurring hundreds of kilometres offshore and thousands of metres below the surface of the sea would make it more difficult to regulate, monitor and enforce than typical marine activities.

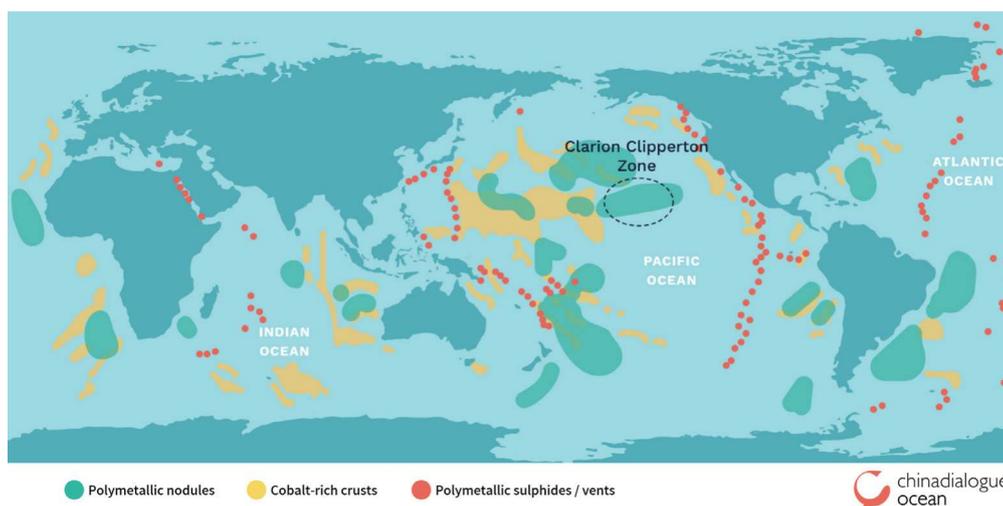
A push to allow mining

In the meantime, a determined group of companies is seeking ways to begin mining in international waters despite the risks and unknowns.

The ecology of the deep ocean is particularly sensitive to damage and slow to recover. Tracks from mining trials 30 years ago are still visible today, with [researchers finding](#) reduced microbial activity in these areas, which has implications throughout the marine food web. And larger forms of deep sea marine life directly depend on the nodules being targeted, so any damage caused by removing them would negatively affect [the integrity of the food web](#) and be permanent. Yet, companies could begin mining before ISA Member States agree on a final set of regulations.

For example, one mining company is seeking to start operations by 2026 and has indicated its intention to pursue options such as applying for a permit through a government that has not ratified UNCLOS, or submitting an application to the ISA under a clause that could allow for unregulated mining. This latter possibility exists because of a nuance in the ISA's charter that requires it to adopt regulations within two years of receiving notification that an application is forthcoming. If the ISA fails to meet that deadline, it must still consider the subsequent application.

In July 2021, the company notified the ISA of its intent to apply through a sponsoring Member State. The ISA missed the July 2023 deadline to adopt the regulations and now faces the possibility of granting that mining application without having regulations in place.



The three main types of mineral resources that occur deep below the ocean's surface include seafloor massive sulfides in hydrothermal vents, cobalt-rich crusts on seamounts, and polymetallic nodules on abyssal plains.

Credit: Source: Miller et al., 2018. Graphic: Ed Harrison / Dialogue Earth, CC BY NC ND

The case for a precautionary approach

Given the gaps in governance and the scientific evidence of potential harm to deep-ocean life from mining, Member States and the ISA are likely open to legal challenges if mining proceeds without finalized regulations in place. Legal experts have also suggested that under the current circumstances, a moratorium on exploitation activity is not only [consistent with UNCLOS but also required by it](#).

Given how fast mineral needs change and the fact that recycling is improving, many experts question if there is sufficient long-term need for deep-seabed minerals to justify the risks of mining. For example, companies have developed lithium batteries and a newer sodium-based battery technology that do not rely on materials sourced from the deep sea. In fact, one-third of electric vehicles produced today do not use the metals that seabed mining could supply.

Another reason for a moratorium or pause on mining activity is that even in the most well-studied regions of the deep sea – including areas where governments and companies are exploring for minerals to mine – [significant gaps persist](#) in experts' understanding of the environment and the species it supports. Scientists estimate that more than 5 000 benthic species – organisms that live on the seafloor – in the Clarion-Clipperton Fracture Zone, which is located in the Pacific between Mexico and Hawaii and is the world's largest deep sea mineral exploration frontier, remain unnamed and thousands more remain [undiscovered](#).

Although scientists generally understand many of the likely effects of deep sea mining, in the absence of sufficient information, it is impossible to ascertain with any confidence how intense, far-ranging, or long-lasting any environmental harm will be. This, in turn, prevents ISA Member States from setting appropriate thresholds for damage that would avoid harm to the marine environment.

ISA Member States continue to debate the contentious issue of what constitutes a fair and sufficient payment rate and have not begun meaningful discussions on how to ensure equitable, transparent payments to countries.

Meanwhile, over the past three years, there have been growing [calls for a moratorium](#) or precautionary pause on seabed mining by more than 30 countries, along with indigenous groups, scientists, conservation organizations and others concerned about insufficient scientific knowledge of the deep sea. Many have cited the need for robust regulations and more confidence in the ISA as an effective regulator.

And an increasing number of investors, insurers and reinsurers, and downstream mineral users such as private companies have [expressed significant concerns](#) about deep sea mining, threatening the viability of any potential seabed mining industry.

Downstream users that have joined the call for a moratorium include technology companies and automotive manufacturers that specifically cite environmental concerns.

Relationship to other international agreements

The 2023 adoption of the Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (the BBNJ Agreement, also referred to as the high seas treaty) by consensus among United Nations Member States demonstrated a growing interest in biodiversity conservation in the ocean. This high seas treaty, once it is in force, will provide a platform to coordinate efforts to protect marine life in areas beyond national jurisdiction. In the meantime, the ISA and other international bodies – such as the Inter-American Tropical Tuna Commission, which manages tuna fishing in and around the Clarion-Clipperton Fracture Zone – should share information about each other's activities to ensure that all stakeholders are aware of, and can provide input on, any extractive efforts that may impact the wider ocean ecosystem.

Outside of the Clarion-Clipperton Fracture Zone, there is significant geographical overlap between prospective mining areas and fishery stocks such as tuna, billfish and squid throughout the global ocean. And the effects of deep sea mining could extend beyond the boundaries of these areas, which underscores the importance of understanding the risks and examining how countries' fishery catches might be impacted by mining.

Conclusion

ISA Member States still have a significant amount of negotiation ahead before they finalize their regulations and must use those discussions to ensure that the rules prevent damage to the ocean and to the commercial fishing industry. Environmental risks from deep sea mining are too great for haste, and ISA Member States must not squander this opportunity to put in place robust and enforceable regulations before any mining is considered.

For the foreseeable future, the best course of action is for ISA Member States to implement a moratorium or precautionary pause on mining and work to thoughtfully address scientific gaps so that decisions can be fully informed and stakeholders – including those reliant on healthy fish stocks – can be confident in the future of the ocean. 🌊



Julian Jackson heads Pew's work to safeguard the marine environment by advocating for precaution in the development of a management regime for deep-seabed mining at the International Seabed Authority. He also leads engagement in Europe on Pew's campaign to protect ocean life on the high seas.

Before coming to Pew, Jackson was a civil servant with the UK government, working on international agriculture and biodiversity policies. He led the UK's delegation to various international negotiations with the Food and Agriculture Organization of the United Nations, and the Convention on Biological Diversity. He also co-authored several papers on the conservation and sustainable use of genetic resources and is passionate about climate change and biodiversity loss. He holds a diploma in physiology and pharmacology from the University of Southampton, England.