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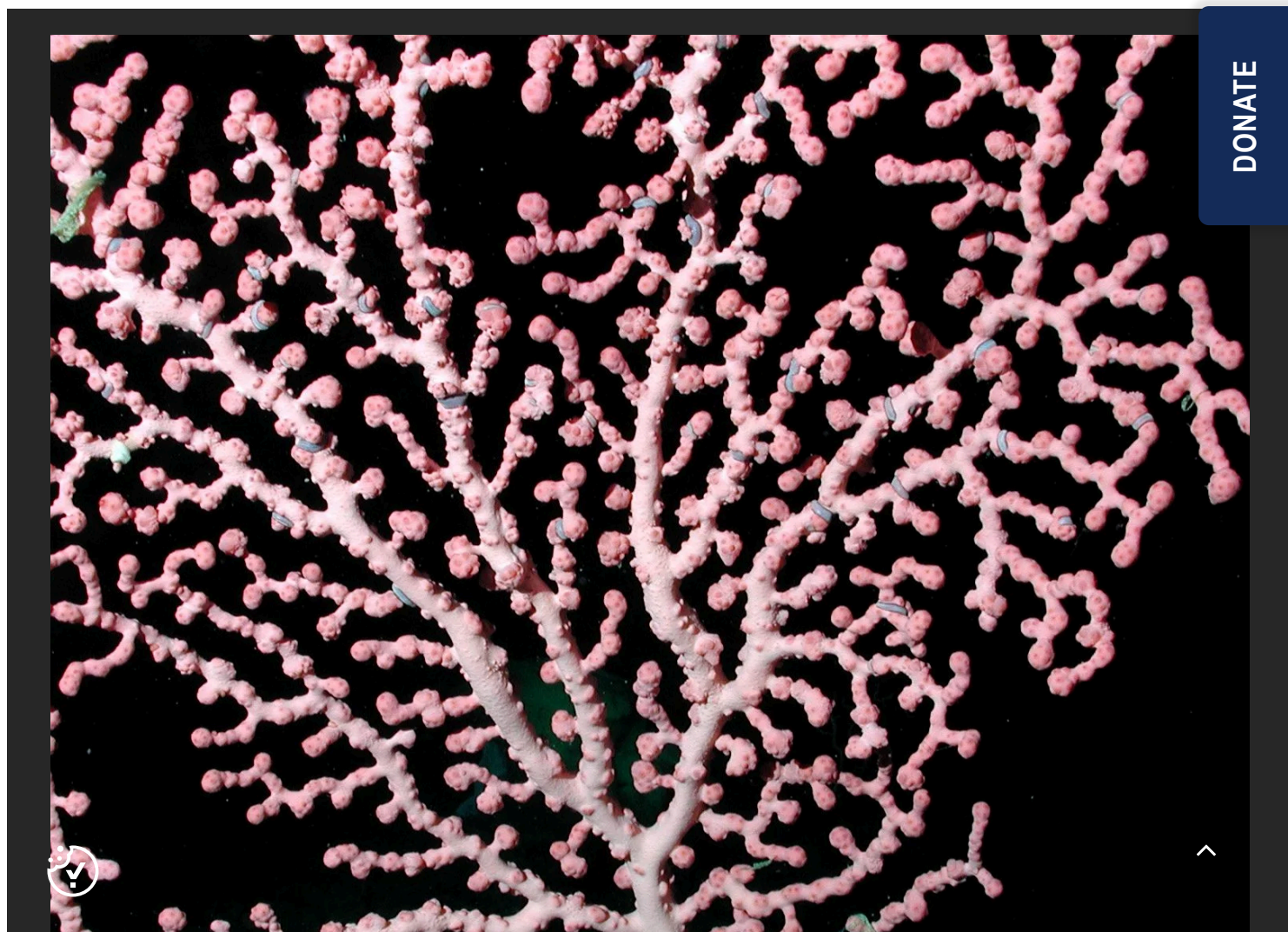
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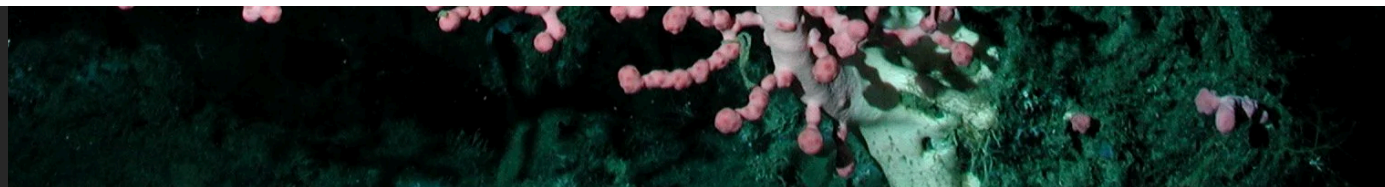
October 1, 2025

INTO THE ABYSS

BY: [SARAH HOLCOMB](#)



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The race to mine the deep sea – and what's at stake

About 1,000 meters below the ocean's surface, the last traces of light from the sun and moon disappear into inky black. Among the ocean's strongest divers, sperm whales and leatherback sea turtles can swim to the threshold, but rarely do they enter these lightless depths. This is the "midnight zone," and entering it is like plunging into another planet.

Down here, the only flashes of light come from animals' bioluminescent bodies. Deep sea anglerfish, whose huge mouths hold long, sharp teeth, wear a lure attached to their heads like a wand to draw in prey. For red comb jellies, darkness provides camouflage — without sun, their red color turns jet black.

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Polymetallic nodules found in the South Pacific. © Hannes Grobe/AWI

At 1,000 meters (3,280 feet), the temperature is about that of a refrigerator. Deeper down, it gets colder and quieter near the ocean seabeds, some of which are paved with metallic gray rocks, resembling underwater cobblestone streets. Each rock started as something small — like a shark tooth or tiny fossil. Over millions of years, metals like iron, manganese, cobalt, and nickel slowly layered on, bringing some of these rocks to the size of a potato.

We now know these rocks as "polymetallic nodules," and companies want to use their metals for everything from computers and phones to electric vehicles and wind turbines. Companies

around the world are testing equipment to extract the nodules, gauging their ability to send robots deeper than most sperm whales or leatherback sea turtles have ventured. They want to



Exploring the deep sea

For centuries, scientists assumed that the chilly deep sea was empty of life. Now we know that the deep sea (generally meaning 200 to 10,000 meters, or 650 to 32,800 feet deep) is the largest habitable place on the planet. But the vast majority of species living there are new to scientists. Less than 10% of deep-sea species are named. As companies ramp up their search for minerals underwater, scientists are intensifying their efforts to document the ocean's deepest dwellers — and [investigate the impact mining operations could have on their habitats](#).

Using a robot capable of diving over 4,000 meters (14,000 feet), scientists explored underwater mountains along the Nazca and Salas y Gomez Ridge, off the coast of Chile, in 2024. One scientist described the number of new species sighted as mind-blowing. They witnessed a large group of Humboldt squid feeding and a bristle worm that some describe as “a living disco ball.”

Deep-sea species live in a range of habitats. There are vibrant seamounts (underwater mountains, like those found off the coast of Chile), teeming with corals, sponges, and fish, as well as hydrothermal vents, sometimes likened to hot springs on the ocean floor. Both of these habitats are filled with coveted minerals. Seamounts are crusted in cobalt, iron, nickel, and manganese, while hydrothermal vents produce small structures rich in gold, nickel, copper, and other metals.

At the moment, the international spotlight is not fixed on seamounts or hydrothermal vents. Instead, all eyes are on a third habitat: the abyssal plains. Home to the sought-after polymetallic nodules, these flat, wide-open areas, while likely not as dense with life as the seamounts or vents, are no less striking. Small animals like corals, worms, and sponges live directly on the nodules.

To reach the nodules, deep-sea mining companies are testing robotic technologies. The Canadian-based “The Metals Company” (TMC) has developed a process in which a vehicle, about the size of a bus, would journey underwater, grab the nodules, and send them up a miles-long vertical tube to a ship waiting on the surface. Some have nicknamed the technology “the world’s largest vacuum cleaner,” while experts including renowned fisheries scientist and Oceana Board Member Dr. Daniel Pauly describe it as a “bulldozer” because it will wipe out the sponges and corals living on the nodules.

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Any industrial activity cannot help but disrupt the quiet deep sea, scientists



Any industrial activity cannot help but disrupt the quiet deep sea, scientists say. In a public letter, 15 marine scientists and legal scholars warned that mining may destroy deep-sea habitats, drive species extinct, and introduce vibrations, noises, chemicals, and clouds of sediment into the ecosystem.

In the deep sea, pollution would be especially problematic. Deep-dwelling fish have evolved to live in this unique environment — and despite being a harsh place to live, it's a clean one. Unlike fish in shallow waters that are adapted to deal with sediment clouding their waters, deep-sea fish have no need to cough dirt through their gills, points out Pauly. Like cave animals who go blind, fish in ocean depths have likely lost their ability to exhale the pollution from their bodies. Disturbance could be a death sentence.

The equipment used to extract the nodules will create clouds of dust that could take years to dissipate. Scars from some of the world's first deep-sea mining pilot testing, carried out in 1970, still remain today: a sign that does not bode well for recovery.

For decades, scientists have been working to map out the mysterious deep sea — and there is much still to learn.

But mining corporations are growing restless. They are waiting for the International Seabed Authority (ISA) to issue overdue regulations that would allow their extraction operations to get started. All eyes are on the Clarion-Clipperton Zone, an area between Hawaii and Central America spanning 4.5 million square kilometers (1.7 million square miles), home to an abundance of polymetallic nodules.

The zone has already been parceled into a patchwork of areas where different countries and sponsored companies have been granted exclusive licenses to explore — and, possibly soon, to mine.

Unlike the quiet ocean depths, the conversation on land is growing loud and heated.

Who governs the deep sea?



An invisible line traces around every coastal country on Earth. This line marks 200 nautical

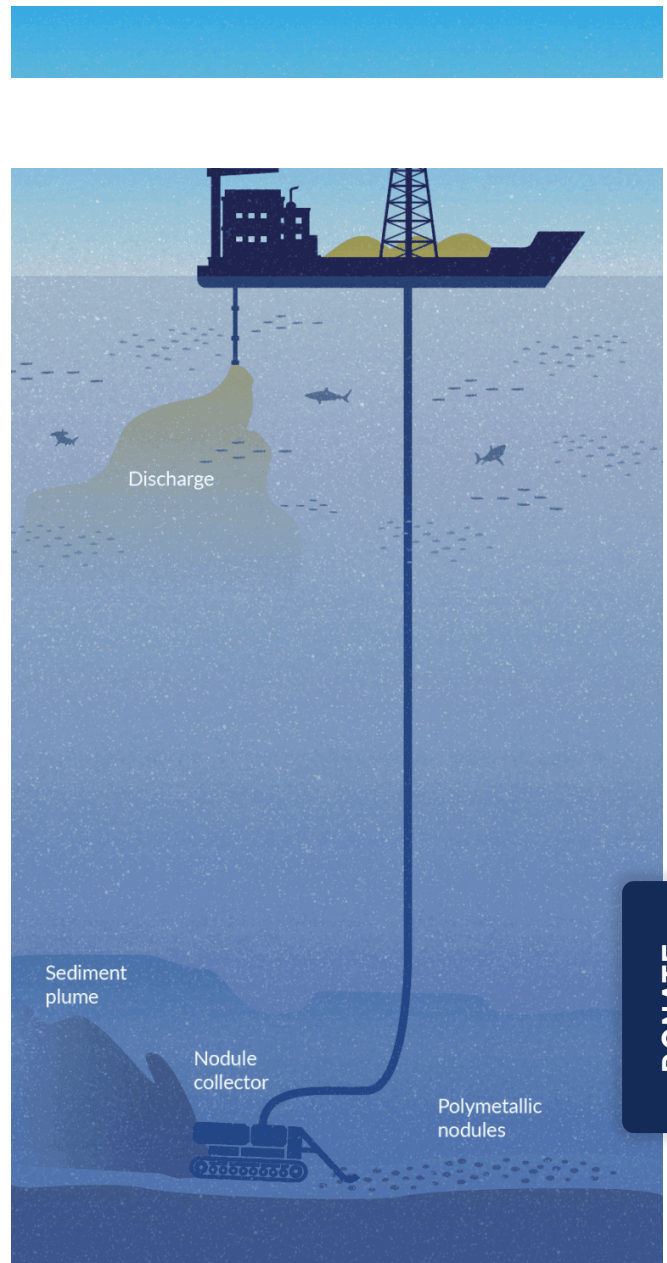


fishing, and economic activity remain in the country's control. Venture beyond, and you are in international waters — the high seas. Nearly two thirds of the world's ocean — including most of the deep sea — is outside national jurisdiction. Anyone's decision on deep-sea mining affects everyone.

A century after the discovery of polymetallic nodules, world leaders were growing more eager for minerals as geopolitical factors sent metal prices soaring in the 1960s and 70s. At the United Nations General Assembly meeting in 1967, Maltese Diplomat Arvid Pardo took the floor to insist that the promises of the ocean's minerals (and wealth) belonged to all of humanity — not just the wealthier countries who could get there first.

Pardo's speech set the stage for the United Nations Convention on the Law of the Sea (UNCLOS) — described as the “constitution for the oceans.” The convention included criteria for future deep-sea mining. Any activity must benefit humankind broadly, which meant ensuring developing countries would have equal access to areas to mine. The parties also agreed that all efforts should protect the marine environment. To date, 167 states and the European Union have ratified the international law (the United States is one of the few that has not).

To ensure equitable access to the seabed, UNCLOS requires that for every parcel of ocean granted to a mining company, another is set aside to be used by or to benefit “developing” countries. It also requires that at least one country supervises the company to ensure they comply with the law.



The deep-sea mining process for polymetallic nodules would involve sending a vehicle thousands of feet underwater onto the seabeds. Adapted from WHOI, ©Oceana/Alan Po

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A deep-sea coral community latches onto the seafloor in the Gulf of Mexico. © NOAA

But some of the companies applying to



...ing a mining loophole. TMC, for example, instead of being supervised by its home country of Canada, sought out the small Pacific Island nation of Nauru, home to about 12,000 islanders, as its sponsor. This move gives the area of ocean set aside for Nauru in addition to the area the company was

already given access to. Some also worry that small island sponsors like Nauru will be less likely to call out powerful international corporations for illegal activities or failures to protect the marine environment.

So far, the ISA committee has approved all applications to explore areas for deep-sea mining, though there isn't a pathway yet for approved commercial-scale exploitation. But one country is shaking up the plot.

The US rushes ahead

In April 2025, President Trump announced a stunning shift in the so-called "gold rush" to mine the deep sea. The president issued an executive order to bypass international law, directing U.S. officials to fast-track a process for companies looking to mine, including in international waters. Less than a week after the announcement, TMC submitted an application to the U.S. government to mine in the Clarion-Clipperton Zone.

To justify these actions, the president's executive order cited the U.S. Deep Sea Hard Mineral Resources Act adopted in 1980 — originally intended as an interim measure, pending the U.S. signing onto the UNCLOS agreement, which has not happened.



Many advocacy organizations, scientists, and legal experts have criticized the the administration's move. "Fast-tracking deep-sea mining by the ISA's global regulatory processes



Oceana Chief Scientist and Senior Vice President Dr. Kathryn Matthews says that the executive order prioritizes short-term profits over the long-term wellbeing of the oceans and the people who rely on them. "This is a clear case of putting mining companies' greed over common sense. Any attempt to accelerate deep-sea mining without proper safeguards will only speed up the destruction of our oceans."

What about climate change?

In the debate about deep-sea mining, climate change looms large. The same minerals found in the deep-sea are used for electric car batteries, wind turbine generators, and solar panels. Deep-sea mining, some proponents argue, is necessary to save humanity from catastrophic planetary warming.

As technologies rapidly evolve, however, the situation is looking less clear. Advances in electric vehicle battery technology, for example, are evolving beyond needing the cobalt or manganese that the polymetallic nodules offer.

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"From a technological standpoint, it does not look like deep-sea mining is necessary. While deep-sea mining companies would clearly benefit from extracting from the deep sea, it's unclear if anyone else would. One thing we do know is that marine life in the deep sea will suffer."



-Oceana Scientist Sarah Bedolfe



As of May 2025, over 65 businesses, including technology companies and electric vehicle manufacturers, signed on to a statement calling for caution around deep-sea mining — and a temporary pause until we know more about how this mining could impact deep-sea life.

Supporters of deep-sea mining argue it could, in theory, take the pressure off land-based mining. But the first priority should be reducing demand for virgin materials and increasing metal recycling, Oceana's scientists say — not seeking pristine new areas to exploit. "We see no evidence that deep-sea mining would replace land-based mining — it seems more likely that it would only add to the overall pollution created by mining activities," Bedolfe says.

According to Matthews, despite the promise of deep-sea mining to increase clean energy, mining could have the opposite effect. The deep sea is the largest "carbon sink" on Earth and has played a key role in buffering climate change from past human-caused emissions. Thanks to the ocean, more than 90% of the excess heat humans have created has already been absorbed, she says. "Damaging these understudied habitats will surely compromise their ability to function as they have, and likely threaten their ability to mitigate climate change."

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Like everything about deep-sea mining, the full impact remains a mystery.





Cobalt-rich crusts build up on the surfaces of seamounts. A movement is building for a moratorium on these habitats
NOAA Okeanos Explorer Program

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The movement for a moratorium

As the Trump administration works to fast-track deep-sea mining, a movement for a moratorium is building. Over 40 countries are now calling for a pause mining polymetallic nodules.

So are seafood industry groups, biodiversity experts, and major corporations. Nearly 1,000 scientists from 70 countries similarly called for a pause on deep-sea mining in a letter stating that its effects on marine ecosystems and biodiversity “would be irreversible on a multi-generational timescale.”

Oceana supports this moratorium, along with 130+ other ocean conservation groups in the Deep Sea Conservation Coalition, and is calling for a complete ban on mining hydrothermal vents and cobalt-rich crusts. Instead of opening a new frontier for exploitation, the coalition argues that international efforts should focus on continuing to learn more about the deep sea while creating more responsible systems for production, consumption, and reuse here on land.



Humans have seen just 0.001% of the deep sea, equal to the size of the smallest U.S. state, Rhode Island. Destroying this marine environment without adequately understanding it is a significant



“Our maps of Mars are more accurate than our maps of the deep-sea floor. Assuming that we understand an ecosystem that we’ve only just begun exploring — enough to safely and responsibly mine it — is hubris,” says Matthews.

“The contrived race to mine under the guise of green energy is a distraction from the grave consequences mining could have for our ocean and climate. We must protect the deep sea while we continue to learn more about it.”

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