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The Clarion-Clipperton Zone

Valuable minerals and many unusual species can be found on the eastern Pacific Ocean seafloor

Overview

The Clarion-Clipperton Zone (CCZ) spans 4.5 million square kilometers (1.7 million square miles) between Hawaii and Mexico, an abyssal plain as wide as the continental United States and punctuated by seamounts. Lying atop the muddy bottom or embedded just beneath it are trillions of potato-size polymetallic nodules. These rocklike deposits contain nickel, manganese, copper, zinc, cobalt, and other minerals.

At these depths—completely dark but for occasional flashes of bioluminescence—the nodules are often the only hard substrate on a seabed of soft clay, which makes them attractive homes for creatures in need of anchor or habitat. The sediment surrounding the nodules also harbors remarkably high biodiversity.

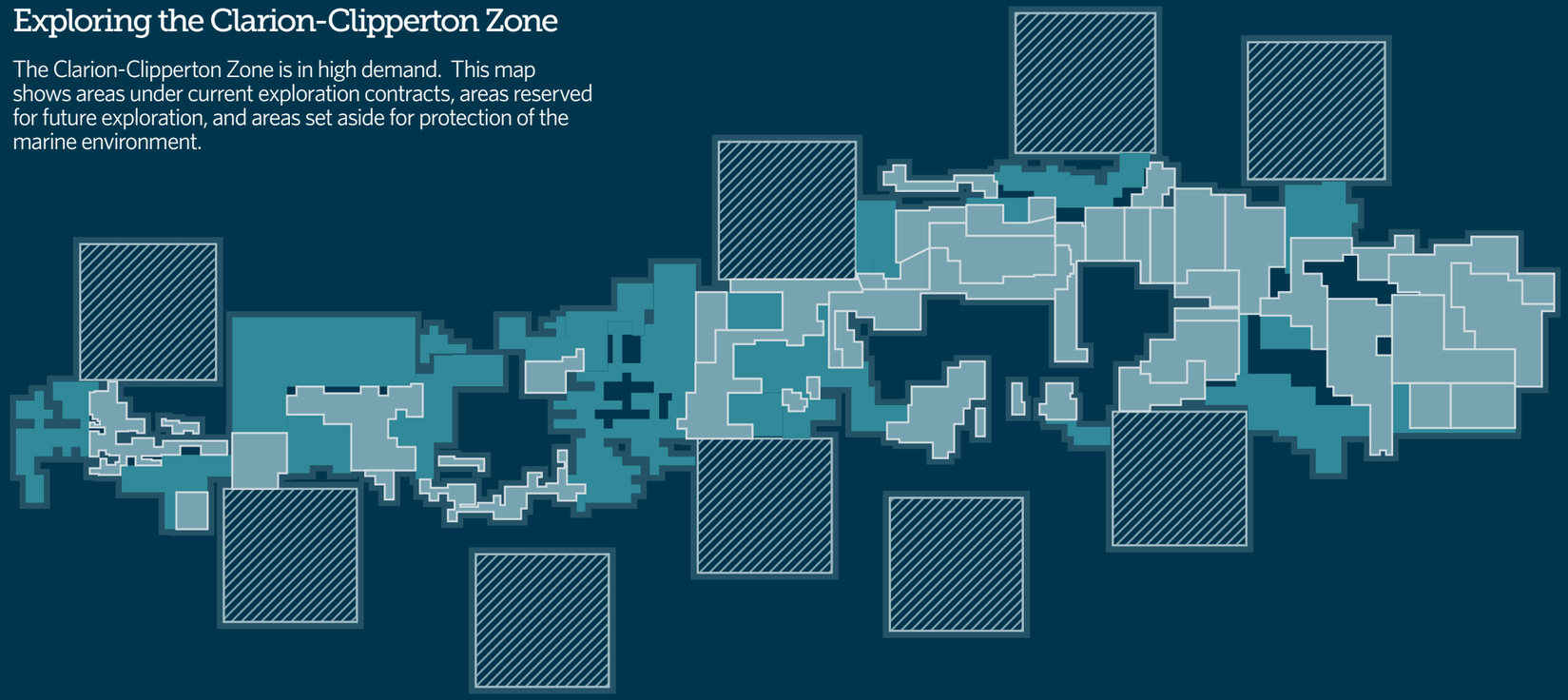
The International Seabed Authority (ISA), the organization responsible for writing the rules for mining in seabed areas beyond national jurisdictions, has awarded 16 exploration contracts to state sponsors and contractors allowing them to assess mining opportunities within the CCZ.

Mining the nodules would involve scraping off the top layer of the ocean floor, separating the nodules from the mud, using a giant tube to pump them to a surface ship, and returning the water and fine particles through another tube. Many marine scientists are concerned about the potential impacts of disturbing the seabed in this manner. Nodules form over millions of years and cannot be replaced in any meaningful way.[1] And scientists are just beginning to study some of the array of species that live at these depths, from sponges and sea anemones to shrimps and octopods. Little is known about how far they range, how populations are connected, and what damage may be caused by the spread of sediment plumes and other effects of mining. Scientific monitoring of experimental dredge sites in deep-sea sediment has shown that decades after a site is disturbed, few if any communities of organisms have recovered.[2]

A broad consensus is emerging among scientists that the ISA should prohibit seabed mining in at least one-third of the Clarion-Clipperton Zone and put stringent rules in place where mining is permitted.

Exploring the Clarion-Clipperton Zone

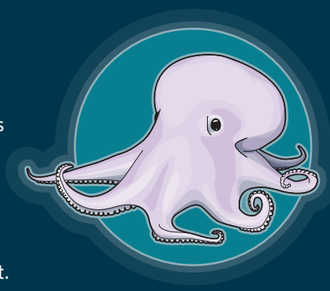
The Clarion-Clipperton Zone is in high demand. This map shows areas under current exploration contracts, areas reserved for future exploration, and areas set aside for protection of the marine environment.



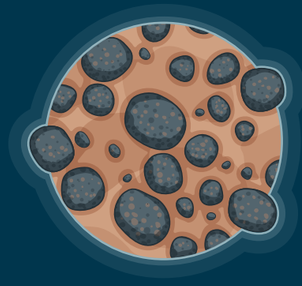
The ISA Environmental Management Plan for the CCZ recognizes nine subregions that differ in productivity, depth, and biology. It established no-mining areas in each to protect a range of habitats and biodiversity.

Many CCZ seamounts have peaks that rise to 2,000 meters (1.2 miles) below the surface.[3] They are known for their biodiversity, hosting deep-water corals, sponges, and fish.

Many creatures that inhabit the CCZ live more than 5,000 meters (3.1 miles) beneath the ocean's surface. These creatures have adapted in ways that allow them to survive crushing pressure in a near-lightless environment.



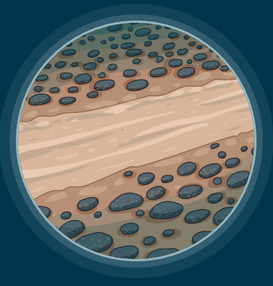
In 2016, scientists discovered a new species of octopus 4,000 meters (2.5 miles) below the sea. Dubbed the ghost octopus and nicknamed "Casper," it lays its eggs on sponge stalks anchored to manganese nodules.[4]



Polymetallic nodules are found on the abyssal plains of all major oceans. The CCZ has the largest concentration of nodule fields.[5]

Scientists are continuously discovering new species in the CCZ. By one estimate, 90 percent of the species that researchers collect are new to science.[6]

Xenophyophores are single-celled creatures the size of tennis balls, or larger, that live on the seafloor—often attached to nodules—and sediment to build protective coverings.[7]



A 1978 experiment to recover nodules removed a layer of sediment 4.5 centimeters thick and 1.5 meters wide from the CCZ area. Twenty-six years later, the disturbance was still clearly visible.[8]

Endnotes

1 C.L. Van Dover et al., "Biodiversity Loss From Deep-Sea Mining," *Nature Geoscience* 10 (2017): 464–65, http://www.nature.com/ngeo/journal/v10/n7/full/ngeo2983.html.

2 Daniel O.B. Jones et al., "Biological Responses to Disturbance From Simulated Deep-Sea Polymetallic Nodule Mining," *PloS ONE* 12, no. 2 (2017): e0171750, https://doi.org/10.1371/journal.pone.0171750; Dmitry M. Miljutin et al., "Deep-Sea Nematode Assemblage Has Not Recovered 26 Years After Experimental Mining of Polymetallic Nodules (Clarion-Clipperton Fracture Zone, Tropical Eastern Pacific)," *Deep Sea Research, Part I, Oceanographic Research Papers* 58, no. 8 (2011): 885–97, http://archimer.ifremer.fr/doc/00047/15867/13321.pdf.

3 International Seabed Authority, Legal and Technical Commission, "Environmental Management Plan for the Clarion-Clipperton Zone" (July 13, 2011), https://www.isa.org.jm/sites/default/files/files/documents/isba-17ltc-7_0.pdf.

4 Ben Guarino, "Meet the Charming 'Ghost Octopods' Found Among Valuable Metallic Balls on the Deep Sea Floor," *The Washington Post*, Dec. 20, 2016, https://www.washingtonpost.com/news/morning-mix/wp/2016/12/20/meet-the-charming-ghost-octopods-found-living-among-valuable-metallic-balls-on-the-deep-sea-floor/?utm_term=.8b520c87ac10.

5 T. Kuhn et al., "Chapter 2: Composition, Formation, and Occurrence of Polymetallic Nodules," in *Deep Sea Mining Resource Potential, Technical and Environmental Considerations*, ed. Rahul Sharma (New York: Springer International Publishing, 2017), 52.

6 Managing Impacts of Deep Sea Resource Exploitation, "Biodiversity in the Clarion-Clipperton Zone," http://eu-midas.net/sites/default/files/downloads/Briefs/MIDAS_CCZ_biodiversity_brief_lowres.pdf.

7 Diva J. Amon et al., "Insights Into the Abundance and Diversity of Abyssal Megafauna in a Polymetallic-Nodule Region in the Eastern Clarion-Clipperton Zone," *Scientific Reports* 6 (2016): 30492, https://www.nature.com/articles/srep30492.

8 Elaine Baker and Yannick Beaudoin, eds., "Deep Sea Minerals: Manganese Nodules, a Physical, Biological, Environmental, and Technical Review," Secretariat of the Pacific Community (2013), 36, http://dsm.gsd.spc.int/public/files/meetings/TrainingWorkshop4/UNEP_vol1B.pdf; Dmitry M. Miljutin et al., "Deep-Sea Nematode Assemblage Has Not Recovered 26 Years After Experimental Mining of Polymetallic Nodules (Clarion-Clipperton Fracture Zone, Tropical Eastern Pacific)," *Deep Sea Research, Part I, Oceanographic Research Papers* 58, no. 8 (2011): 885–97, http://archimer.ifremer.fr/doc/00047/15867/13321.pdf.

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