

Abundant and diverse ecosystem found in area targeted for deep-sea mining

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An *Amperima holothurian* or sea cucumber seen on a bed of polymetallic nodules in the eastern Clarion-Clipperton Zone. Several corals, a sponge and a brittle star can also be seen in the image. Credit: Diva Amon and Craig Smith, University of Hawai'i at Mānoa

In a study published in *Scientific Reports*, scientists discovered impressive abundance and diversity among the creatures living on the seafloor in the Clarion-Clipperton Zone (CCZ)—an area in the

equatorial Pacific Ocean being targeted for deep-sea mining. The study, lead authored by Diva Amon, a post-doctoral researcher at the University of Hawai'i at Mānoa School of Ocean and Earth Science and Technology (SOEST), found that more than half of the species they collected were new to science, reiterating how little is known about life on the seafloor in this region.

"We found that this exploration claim area harbors one of the most diverse communities of megafauna [animals over 2 cm in size] to be recorded at abyssal depths in the deep sea," said Amon.

The deep sea is where the next frontier of mining will take place. A combination of biological, chemical and geological processes has led to the formation of high concentrations of polymetallic "manganese" nodules on the deep [seafloor](#) in the CCZ—an area nearly the size of the contiguous United States. These nodules are potentially valuable sources of copper, nickel, cobalt and manganese, among other metals, which has led to an interest in mining this region. All of the potential polymetallic-nodule exploration contracts that have been granted in the Pacific are in this region, according to the International Seabed Authority.

This study, part of the ABYSSLINE Project, was the first to characterize the abundance and diversity of seafloor-dwelling animals, a key component of deep-sea ecosystems, in an exploration claim area leased to UK Seabed Resources Ltd (UK-1) in the eastern portion of the CCZ.



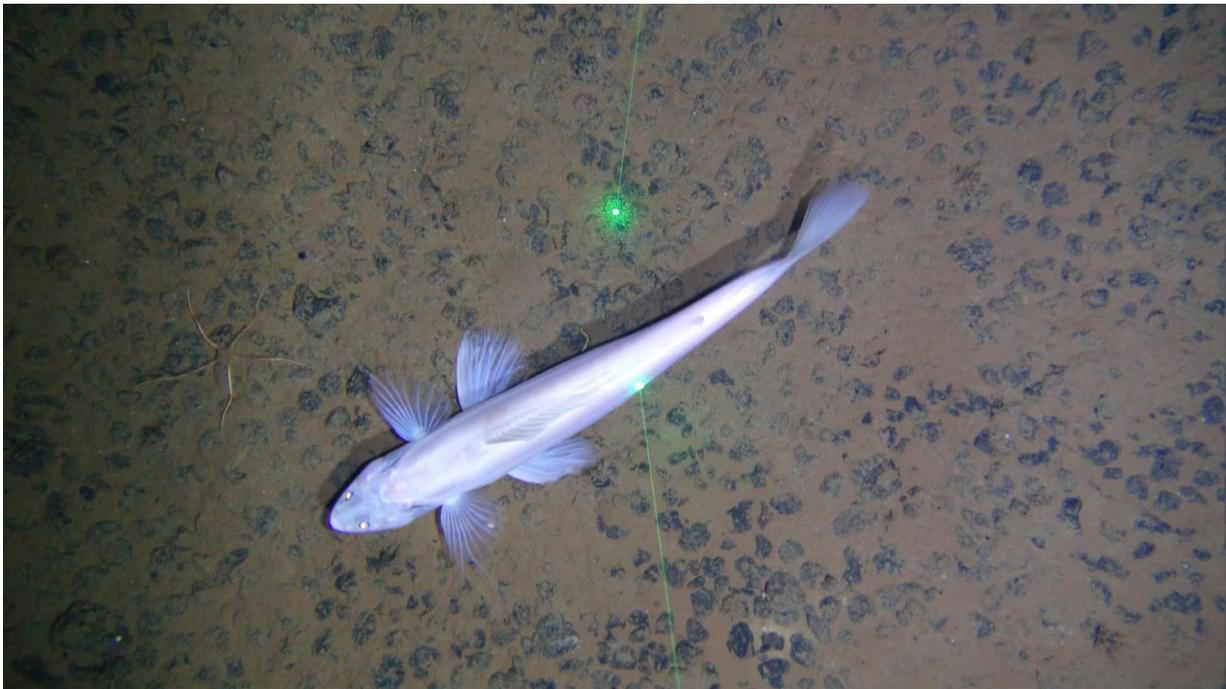
A species of cnidarian in the genus *Relicanthus* with 8-foot long tentacles attached to a dead sponge stalk on a nodule in the eastern Clarion-Clipperton Zone. These are closely related to anemones. Credit: Diva Amon and Craig Smith, University of Hawai'i at Mānoa

Using a remotely operated vehicle, the research team surveyed the seafloor at four sites within the UK-1 exploration contract area and at a site east of the UK-1 area to estimate abundance and diversity of the ecosystems.

The preliminary data from these surveys showed that more animals live on the seafloor in areas with higher nodule abundance. Further, the majority of the megafaunal diversity also appears to be dependent on the polymetallic nodules themselves, and thus are likely to be negatively affected by mining impacts.

"The biggest surprises of this study were the high diversity, the large numbers of new species and the fact that more than half of the species

seen rely on the nodules—the very part of the habitat that will be removed during the mining process," said Amon.



The fish *Bathysaurus mollis* and brittle star seen in a field of polymetallic nodules in the eastern Clarion-Clipperton Zone. Credit: Diva Amon and Craig Smith, University of Hawai'i at Mānoa

Exploitation plans are pushing ahead even though knowledge of the seafloor ecosystem in this region is still limited.

"In order to more effectively manage the area and mitigate the environmental impacts of [deep-sea](#) mining in the CCZ and within the UK-1 contract area, baseline knowledge of the abundance, diversity, and species ranges of megafauna—a key component of this ecosystem—is essential," said Craig Smith, oceanography professor at UHM SOEST

and ABYSSLINE lead investigator.

The ABYSSLINE team will be publishing many more papers about the seafloor biology of the CCZ, with forthcoming papers from UHM scientists including an atlas of megafauna from the UK-1 exploration contract area, a study documenting extremely high [diversity](#) in the community of macrofaunal community (crustaceans, worms, mollusks and other invertebrates between 2 and 0.3 cm in size) in the UK-1 exploration claim area.

More information: 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* (2016). [DOI: 10.1038/srep30492](#)

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