Academic warns deep sea mining activity could affect CO2 absorption rates in ocean ecosystems

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Credit: Heriot-Watt University

A leading marine scientist from Heriot-Watt University took the opportunity of a lifetime to dive to the bottom of the ocean.

Using the deep-sea submarine named the Alvin, which was made famous by its first survey of the wreck of the Titanic, Professor Andrew K. Sweetman from the Lyell Centre in Edinburgh made the 2500m descent to the ocean floor off the west coast of Mexico in December 2019.

Here, he helped examine the recovery of deep-sea vents from underwater volcanic eruptions and collected sea life samples to examine the prevalence of parasites in them. He also visited historic volcanic vent sites that were no longer active to document how the biology changes as very little is known about these ecosystems.

This isn't the first time Professor Sweetman has studied the deep-sea floor. Some of his recent work in the Pacific Ocean found a potentially new source of organic matter—microbial biomass produced from CO_2—being produced in situ that could act as food for deep-sea organisms. Before this, researchers thought the biggest source of food to deep seafloor ecosystems was organic matter—like dead fish and plankton.

Professor Sweetman said that "bacterial biomass potentially becomes a food source for other animals in the deep sea, so actually what we've discovered is a potential alternative food source in the deepest parts of the ocean, where we thought there was none. Also, if the findings from the study are scaled up to the oceans globally, it could mean 200 million tons of CO_2 is being turned into biomass every year."

Through newly funded research projects, Professor Sweetman aims to explore the importance of this new process in other regions of the Pacific and Atlantic Oceans over the next 4-5 years.

He says: "We need to explore this process in greater detail as at present, we don't know where the energy is coming from for CO_2 fixation, and what microbes are fixing C into their biomass. Once we've figured this out, we can start interrogating the available data on microbial diversity in the deep sea to assess where this process is happening in the ocean."

Professor Sweetman explained that this work is critical for understanding the effects of deep-sea disturbance, such as mining. The area he currently works in the Clarion Clipperton Fracture Zone (CCFZ), Pacific Ocean has been extensively surveyed for its deep-sea mining potential and teams of researchers are now conducting surveys to assess the biodiversity of the CCFZ to understand what impact deep-sea mining might have.

Increasing demand for metals and rare earth elements for use in electronics and renewable energy infrastructure is accelerating research into deep-sea minerals and their potential for exploitation. The CCFZ is of particular importance due to high abundances of polymetallic nodules—ca. 30 billion tons. Nodules here are rich in manganese, copper, cobalt, nickel, and trace metals such as molybdenum, lithium and rare earth elements.

Professor Sweetman explains: "Small scale disturbance experiments that we have conducted have shown limited recovery of sea life and microbes over long periods, therefore deep-sea mining may significantly impact seafloor microbes that may be actively removing CO_2. If a significant amount of CO_2 is removed each year by the microbial communities within mining areas, mining may inadvertently affect this important ecosystem service in the deep sea."

More information: Details of Professor Sweetman's research, his current projects and how you could join his Deep-Sea Ecology and Biogeochemistry research team at the Lyell Centre for Earth and Marine Science and Technology can be found here: deepseaecologyandbiogeochemist … ygroup.wordpress.com