Assessing deep-sea nodule mining impacts on the benthic ecosystem: from large to small scale

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Mining polymetallic nodules in the deep sea will severely impact abyssal seafloor communities through removal of infauna in the upper sediment layers and nodule-attached fauna. Accurately assessing potential ecosystem impacts requires investigating the effects of mining across spatial scales.

Here, we make global estimates of benthic respiration and secondary production of microbes, meiofauna, macrofauna and megafauna. Results indicate that deep-sea mining at the Clarion-Clipperton Fracture Zone will lead to a loss of 0.24% of global marine benthic respiration and 0.22% of global marine benthic secondary production.

At kilometre-scale, analysis of seafloor images from a towed camera system indicated that there was no significant difference in the abundance of Holothuroidea among disturbed, undisturbed and reference sites, 26 years after small-scale (10.8 km^2) experimental disturbance in the DISCOL area.

Similarly, metre-scale investigation of uptake and processsing of isotopically labelled phytodetritus using incubation chambers *in situ* in the DISCOL area indicated no significant difference between disturbed and reference sites, 26 years after experimental disturbance.

Inferences regarding the impact of deep-sea mining must be made with caution: results presented here are based on a relatively small-scale disturbance experiment, and recovery following industrial-scale nodule mining may not occur over similar (few decade), timescales. Nonetheless, deep-sea nodule mining will likely impact ecosystem functioning on the global scale, at least in the short term.