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TITLE: Megafaunal variation in the abyssal landscape of the Clarion Clipperton Zone

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ABSTRACT:

The potential for imminent polymetallic nodule mining in the Clarion Clipperton Fracture Zone (CCZ) has attracted considerable scientific and public attention. This concern stems from both the extremely large seafloor areas that may be impacted by mining, and the very limited knowledge of the fauna and ecology of this region. The environmental factors regulating seafloor ecology are still very poorly understood. In this study, we focus on megafaunal ecology in the proposed conservation zone 'Area of Particular Environmental Interest 6' (study area centred 17°16'N, 122°55'W). We employ bathymetric data to objectively define three landscape types in the area (a level bottom Flat, an elevated Ridge, a depressed Trough; water depth 3950-4250 m) that are characteristic of the wider CCZ. We use direct seabed sampling to characterise the sedimentary environment in each landscape, detecting no statistically significant differences in particle size distributions or organic matter content. Additional seafloor characteristics and data on both the metazoan and xenophyophore components of the megafauna were derived by extensive photographic survey from an autonomous underwater vehicle. Image data revealed that there were statistically significant differences in seafloor cover by nodules and in the occurrence of other hard substrata habitat between landscapes. Statistically significant differences in megafauna standing stock, functional structuring, diversity, and faunal composition were detected between landscapes. The Flat and Ridge areas exhibited a significantly higher standing stock and a distinct assemblage composition compared to the Trough. Geomorphological variations, presumably regulating local bottom water flows and the occurrence of nodule and xenophyophore test substrata, between study areas may be the mechanism driving these assemblage differences. We also used these data to assess the influence of sampling unit size on the estimation of ecological parameters. We discuss these results in the contexts of regional benthic ecology and the appropriate management of potential mining activities in the CCZ and elsewhere in the deep ocean.

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