Megafauna Distribution Patterns Along Different Geomorphological Units In The APEI-4 Of The Clarion Clipperton Fracture Zone

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The potentially imminent start of the exploitation of polymetallic nodule fields in the Clarion-Clipperton Fracture zone (CCFZ) in the Pacific Ocean has highlighted the lack of basic ecological knowledge about these deep-sea abyssal systems. Novel underwater technology enables this extraction, but it conditions its economic feasibility to a minimum seabed disturbance of 3000 m^2 per day. Besides the direct effect of mechanic compression and substrate removal, Mn-nodule mining would also affect habitats located in the margins, or even several hundreds of meters away from the exploitation zones due to the re-deposition of sediment plumes. Mn-nodule fields have shown to host highly diverse faunas, with samples often composed by a large number of species new to science. The low metabolic rates observed in the fauna living in this oligotrophic benthos has enhanced the general scientific conception that recovery rates after disturbance in this region could be extremely low. Hence, the detection of different habitats and determination of the environmental ranges that delimit these within the CCFZ is crucial for the generation of ecologically comprehensive management policies and legislation. Here we show differences in community composition between 3 different topographical units found within a randomly selected 40 x 40 km square of seafloor located within the area of particular environmental interest (APEI) number 4 of the CCFZ. Significant differences in species richness (S), diversity (H') and evenness (J') were found between three habitats: a flat zone, a ridge zone, and a valley area located between 4050 and 4200 m depth. These stratums were defined a priori, as a result of a terrain classification based on pre-set limits of bathymetric derivatives, such as slope, bathymetric position index and roughness. Relative Mn-nodule cover in each of these areas also showed to have an effect on the community composition and diversity. These results underline substrate composition and seafloor morphology as key environmental factors for the diversification of niches within Mn-nodule fields. However, given the low megafauna densities observed and the large extension of the CCFZ, top-down mapping effectiveness shall be limited until the potential effect of the observational scale and other environmental drivers is better understood. Hence, further exploration is required to map and describe a further number of habitats, and to compare different areas of the CCFZ. A precise spatial determination of the limits and ecological similarity of each of these habitats shall be indispensable to ensure the efficiency of future protection measures.