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TITLE: Limited differences among habitats in deep-sea macrofaunal communities off New Zealand: implications for their vulnerability to anthropogenic disturbance

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ABSTRACT:

Abstract The spread of human activities into the deep sea may pose a high risk to benthic communities and affect ecosystem integrity. The deep sea is characterized by physical and biological heterogeneity and different habitat types are likely to differ in their vulnerability to anthropogenic impacts. However, across-habitat comparisons are rare, and no comprehensive ecological risk assessment has yet been developed. To address this gap in our knowledge, we compared macrofaunal community structure in four habitats (slope, canyons, seamounts and methane seeps) at depths between 700 and 1500 m in the Hikurangi Margin and Bay of Plenty regions off New Zealand. The most striking contrast in community structure was between the two study regions, due to an order of magnitude difference in macrofaunal abundance that we believe was caused by differences in surface productivity and food availability at the sea bed. We found differences in structural and functional attributes of macrofaunal communities among some habitats in the Hikurangi Margin (slope, canyon and seep), but not in the Bay of Plenty. We posit that differences between canyon and slope communities on the Hikurangi Margin are due to enhanced food availability inside canyons compared with adjacent slope habitats. Seep communities were characterized by elevated abundance of both symbiont-bearing and heterotrophic taxa, and were the most distinct, and variable, among the habitats that we considered on the Hikurangi Margin. Communities of seamounts were not distinct from slope or canyon communities on the Hikurangi Margin, probably reflecting similar environmental conditions in these habitats. The communities of deep-sea canyon and seep habitats on the Hikurangi Margin were sufficiently dissimilar from each other and from slope habitats to warrant separate management consideration. By contrast, the low dissimilarity between communities of canyon and slope habitats in the Bay of Plenty suggests that habitat-based management is not required in this region, for macrofauna at least. Although the two study regions share similar species pools, populations of the Hikurangi Margin region may be less vulnerable than the sparser populations of the Bay of Plenty due to the higher availability of potential colonizers and faster population growth. Thus regions, and habitats in some regions, should be subject to separate ecological risk assessment to help identify the key risks and consequences of human activities, and to inform options for reducing or mitigating impacts.

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