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TITLE: Habitat heterogeneity and its influence on benthic biodiversity in oxygen minimum zones

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ABSTRACT:

Abstract Oxygen minimum zones (OMZs; midwater regions with O 2 concentrations <0.5 ml l ?1 ) are mid?water features that intercept continental margins at bathyal depths (100?1000 m). They are particularly well developed in the Eastern Pacific Ocean, the Arabian Sea and the Bay of Bengal. Based on analyses of data from these regions, we consider (i) how benthic habitat heterogeneity is manifested within OMZs, (ii) which aspects of this heterogeneity exert the greatest influence on alpha and beta diversity within particular OMZs and (iii) how heterogeneity associated with OMZs influences regional (gamma) diversity on continental margins. Sources of sea?floor habitat heterogeneity within OMZs include bottom?water oxygen and sulphide gradients, substratum characteristics, bacterial mats, and variations in the organic matter content of the sediment and pH. On some margins, hard grounds, formed of phosphorites, carbonates or biotic substrata, represent distinct subhabitats colonized by encrusting faunas. Most of the heterogeneity associated with OMZs, however, is created by strong sea?floor oxygen gradients, reinforced by changes in sediment characteristics and organic matter content. For the Pakistan margin, combining these parameters revealed clear environmental and faunal differences between the OMZ core and the upper and lower boundary regions. In all Pacific and Arabian Sea OMZs examined, oxygen appears to be the master driver of alpha and beta diversity in all benthic faunal groups for which data exist, as well as macrofaunal assemblage composition, particularly in the OMZ core. However, other factors, notably organic matter quantity and quality and sediment characteristics, come into play as oxygen concentrations begin to rise. The influence of OMZs on meiofaunal, macrofaunal and megafaunal regional (gamma) diversity is difficult to assess. Hypoxia is associated with a reduction in species richness in all benthic faunal groups, but there is also evidence for endemism in OMZ settings. We conclude that, on balance, OMZs probably enhance regional diversity, particularly in taxa such as Foraminifera, which are more tolerant of hypoxia than others. Over evolutionary timescales, they may promote speciation by creating strong gradients in selective pressures and barriers to gene flow.

SOURCE: Marine ecology

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