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TITLE: Pelagic and benthic ecology of the lower interface of the Eastern Tropical Pacific oxygen minimum zone

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ABSTRACT:

The distributions of pelagic and benthic fauna were examined in relation to the lower boundary of the oxygen minimum zone (OMZ) on and near Volcano 7, a seamount that penetrates this feature in the Eastern Tropical Pacific. Although the broad, pronounced OMZ in this region is an effective barrier for most zooplankton, zooplankton abundances, zooplankton feeding rates, and ambient suspended particulate organic carbon (POC) peaked sharply in the lower OMZ (about 740-800 m), in association with the minimum oxygen concentration and the increasing oxygen levels just below it. Zooplankton in the lower OMZ were also larger in size, and the pelagic community included some very abundant, possibly opportunistic, species. Elevated POC and scatter in the light transmission data suggested the existence of a thin, particle-rich, and carbon-rich pelagic layer at the base of the OMZ. Gut contents of planktonic detritivores implied opportunistic ingestion of bacterial aggregates, possibly from this layer. Benthic megafaunal abundances on the seamount, which extended up to 730 m, peaked at about 800 m. There was a consistent vertical progression in the depth of first occurrence of different megafaunal taxa in this depth range, similar to intertidal zonation. Although the vertical gradients of temperature, salinity, and oxygen were gradual at the lower OMZ interface (in contrast to the upper OMZ interface at the thermocline), temporal variability in oxygen levels due to internal wave-induced vertical excursions of the OMZ may produce the distinct zonation in the benthic fauna. The characteristics of the lower OMZ interface result from biological interactions with the chemical and organic matter gradients of the OMZ. Most zooplankton are probably excluded physiologically from pronounced OMZs. The zooplankton abundance peak at the lower interface of the OMZ occurs where oxygen becomes sufficiently high to permit the zooplankton to utilize the high concentrations of organic particles that have descended through the OMZ relatively unaltered because of low metazoan abundance. A similar scenario applies to megabenthic distributions. Plankton layers and a potential short food chain (bacteria to zooplankton) at OMZ interfaces suggest intense utilization and modification of organic material, localized within a thin midwater depth zone. This could be a potentially significant filter for organic material sinking to the deep-sea floor.

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