

Effects of the oxygen minimum zone on squat lobster distributions in the Gulf of California, Mexico

Research Article

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Abstract: Distribution of squat lobsters of the genera *Gastrophychus* (one species), *Uroptychus* (1), *Janetogalthea* (1), *Galacantha* (1), *Munidopsis* (8), and *Munida* (7) in the Gulf of California, Mexico, was plotted vs. the localization of the Oxygen Minimum Zone (OMZ) using bottom projections of the 0.50, 0.25, 0.10, and 0.05 ml l⁻¹ oxylines. Four fringes where oxygen concentrations were equal or lower than these concentrations were obtained, extending from the southern Gulf to about 28°-28°30'N. A total of 172 sampling locations with squat lobsters were plotted on four maps, one for each fringe, noting that with decreasing values of bottom oxygen (*i.e.*, from 0.50 to 0.05 ml l⁻¹) the number of locations with species included between the upper and lower boundaries of these fringes decreases as follows: 34% for 0.50, 25% for 0.25, 12% for 0.10, and 5% for 0.05 ml l⁻¹. The upper and lower limits of the 0.05 ml l⁻¹ fringe are recognised as threshold frontiers, acting as barriers between shallow and deep communities of squat lobsters in the area. The distribution of the localities where species have been collected with respect to the upper and lower boundaries of the 0.05 ml l⁻¹ fringe clearly indicates a segregation pattern. Eight species of *Munida* (except *M. perlata*), and one each of *Janetogalthea* and *Gastrophychus* inhabit the shallow area, just above the OMZ core, with species of *Munida* generally found a rather long distance from this fringe. By contrast, species of *Munidopsis*, *G. diomedea* and *U. pubescens* correspond to the deep area, *i.e.*, below the OMZ core. It is suggested that the core of the OMZ in the Gulf of California serves as a vertical and latitudinal distribution filter, preventing species from freely migrating up and down or south and north.

Keywords: Squat lobsters • Distribution barrier • Oxygen minimum zone • Gulf of California

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1. Introduction

The squat lobsters of the eastern Pacific (including the remote island of Juan Fernandez, Chile) comprise 77 species belonging to eight genera [1-3]. A total of 33 species of Anomura have been recorded in deep water (≥ 350 m) in the Mexican Pacific, representing 39% of all deep-water decapod crustaceans known for the area. Of these 33 species, 24 are squat lobsters: two species of Chirostylidae, one species of Galatheidae, four species of Munnidae, and 17 species of Munidopsidae [3], thus making it by far the most diverse group of Anomura in this habitat.

In the eastern Pacific the presence of a wide Oxygen Minimum Zone (OMZ) in the water column strongly affects the vertical distribution of the fauna [4,5]. Where the OMZ intercepts the continental slope, anoxic and severely hypoxic benthic fringes are found, which are species-poor. Typically, these OMZ communities exhibit depressed diversity and species richness, and high levels of dominance by hypoxia-tolerant species [6,7]. However, in even deeper water, below the core of the OMZ, the oxygen concentrations increase again and a species-rich fauna occurs [6,8-10]. In the OMZ, depth and dissolved oxygen concentration are the most important factors affecting

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