

Expanding our Knowledge on Copepod Community Structure in Subarctic and Subtropical Communities as Revealed by the Species Functional Traits

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In order to manage the effects of climate change on marine resources, a more thorough understanding of community structuring is desired. Here, we analyze copepod species data from the ODATE collection (3142 samples, 40 years, $10^{\circ} \times 10^{\circ}$ area of the Oyashio-Kuroshio Transition System, east of Japan). The area hosts species characteristic of subarctic and subtropical communities. 163 copepod species were classified into five categorical functional traits (i.e., size, food, reproduction, thermal-affinity and coastal-offshore habitat), following online databases and local taxonomic keys. We observe an opposite hump-shaped relationship of species evenness (lower at mid-point) and functional diversity (Rao's Q) (higher at mid-point) with species richness. Subtropical Kuroshio communities tend to be richer with higher species evenness, and yet subarctic and transition waters tend to host communities of higher functional diversity. The distribution of trait values within each functional trait was further examined in relation to the species rank according to their abundance. In subtropical communities, the distribution of trait values in the species rank is homogenous, mirroring the average frequency of those trait values in the species pools. In contrast, in subarctic communities the distribution of trait values differs along the species rank, with dominant species (rank 1) having favorable trait values more often than expected by chance (i.e., frequency of the trait values in rank 1 higher than the average frequency of those trait values in the species pools). Our results suggest that subtropical communities may be niche-saturated towards the most adapted trait values, so that merely having those most adapted trait value confers no strong competitive advantage to a species.

Keywords: species diversity, functional diversity, functional trait, copepod, plankton