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Assessment of multiple biodiversity components reveals new perspectives on conservation for marine fishes in the north-eastern tropical Brazilian continental shelf

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Abstract

Biodiversity is the foundation of ecosystem processes to which all species are intimately connected. The diversity of communities is traditionally assessed by species richness and evenness. Yet, there is a growing interest in considering complementary components dealing with species differences, notably based on their functions within the ecosystem, for which taxonomic distances (mainly drawn from morphological features) can be a proxy. It may contribute, for instance, on a better identification of priority areas for conservation (PAC). Biodiversity indices related to multiple components (species and taxonomic diversities) were computed to investigate spatial patterns of demersal fish assemblages along the north-eastern tropical Brazilian continental shelf (TBS; 9°-5°S). In addition, to evaluate the contribution of nestedness/turnover in the species composition within the study area, a partitioning analysis of beta diversity was performed, based on species presence-absence. Two large-scale multidisciplinary oceanographic surveys (ABRACOS I, II) provided underwater footages and bottom trawl samples for our analyses. A total of 121 species were collected. Alpha diversity was higher at the deepest habitats (30–60m), near to the shelf-break and coralline formations. However, the taxonomic diversity and distinctness were higher in the shallowest habitats (10–30m), close to estuaries mostly composed by sand. Additionally, beta diversity demonstrates a substitution of species (turnover = 0.982/nestedness = 0.018), which highlights a shift in the species composition throughout the study area from north to south. High alpha diversity in deeper environments points out this location as PAC. Conversely, the shallowest habitats contain species that are more taxonomically distant, which agrees with species turnover, and may express the presence of species with different ecosystem functions. Coastal habitats are traditionally highly vulnerable to anthropic impacts, but here not considered as PAC. These results indicate that conservation of shallower habitats nearby estuaries along the TBS is also critical to consider.

Keywords

fish diversity, demersal fish, beta-diversity, priority areas for conservation