

Spatio-temporal variability in the functional diversity of top predator fishes in the western Indian Ocean.

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Environmental changes and human activities can have strong impacts on biodiversity and ecosystem functioning. In this context, there is now a growing importance to consider modifications in the functional diversity of species communities in addition to the traditional quantification of changes in species diversity and composition. In spite of their trophic and economic importance in the open-sea ecosystems, the functional diversity of top predator fishes (tunas, swordfish, sharks, etc.) is still poorly documented. In this work, we investigated the spatio-temporal variations in the functional diversity of fish predators in the western Indian Ocean. Fishes were caught by longliners during scientific surveys performed by IRD between 2001 and 2010 in the Seychelles area and Mozambique Channel. A total of 26 species were identified and 20 functional traits of different types were quantified to describe four main functions: food acquisition, locomotion, social behavior and reproduction. Recent methodological advances, including both indices and multivariate analyses, were performed to quantify on these data complementary facets of functional diversity. Firstly, Gower's coefficient was used to quantify the functional resemblance matrix between species. The choice of this coefficient was justified by the fact that various variable types (quantitative and qualitative) with few missing values were considered in our study. Secondly, based on this resemblance matrix between species and their abundances in each longline, complementary facets of functional diversity were accessed by mean of functional richness, evenness, divergence, dispersion and entropy quadratic indices. They allowed to quantify in a complementary way the multidimensional functional space filled by species of each longline. For the first time, these methodological approaches allowed an original investigation of functional diversity variability of large fish predators in the Indian Ocean, and potential impacts of environmental changes and human activities are discussed.