

Mapping benthic functional diversity on the Flemish Cap (northwest Atlantic)

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Abstract

The functional diversity (FD) of trawl-caught benthic invertebrate communities was described for the Flemish Cap, a high seas fishing bank of ~200 km radius in the northwest Atlantic. Through the use of Hierarchical Modelling of Species Communities (HMSC), an approach belonging to the class of joint species distribution models, we have identified response-traits to the environment and evaluated the influence of such traits on community assembly processes. Although the amount of variation in the species' responses to the covariates mediated by the traits was relatively high (26%), the relationships between the community weighted mean of trait categories in response to covariates were weak and only identified broad trends. Assemblages from the top of the Bank (<500 m) were characterized by higher biomass of small and medium species with short lifespans, whereas large species with longer lifespans, and broadcast spawners were dominant in the deeper assemblages (500 – 1500 m). Higher biomass of crawlers, scavengers, and predator species were found in the regularly fished grounds. Assemblages characterized by deep-sea corals and sponges showed higher FD and were associated with three discrete functions: structure forming, nutrient cycling, and bioturbation activity. Although current closures by NAFO to protect Vulnerable Marine Ecosystems from the adverse impacts of bottom fishing activities protect most of the FD, the spatial scale of influence for each of the functions is unknown and therefore we cannot conclude that the high level of FD found in the current closed areas is sufficient to maintain ecosystem processes over the whole Flemish Cap.

Keywords:

Benthic invertebrates; environmental filtering; functional diversity; joint species distribution model; trait composition

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