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Biological trait modality responses to different anthropogenic pressures in the Belgian Part of the North Sea

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Abstract

Knowledge of the functional diversity of a community is key to understand how the community responds to environmental and anthropogenic stressors. Indicators derived from biological traits could be more suitable to quantify the sensitivity of benthic communities and can be used to detect changes in ecosystem functioning within environmental impact assessments. The Belgian Part of The North Sea represents a highly dynamic area that is subject to a variety of human activities. Within this study, three different physical impacts - dredge disposal, sand extraction and offshore wind farms - were used to assess differences in functional diversity of macrobenthic communities between impact- and control areas.

A total of ten traits were selected, incorporating both response- and effect traits. Functional diversity was then quantified by calculating different indices: FRic, FDiv, FEve, FDis and RaoQ. Shifts in trait composition were determined by Fuzzy Correspondence analysis.

Under chronic disturbance such as high dumping or extraction, the functional diversity indices showed a clear response, especially in terms of functional richness. Within the offshore wind farms, these were less pronounced and also seemed to vary between the two wind farms, however clearly more species that had an attached lifestyle were observed. This is in contrast with the dredging sites, where a shift towards free-living species was observed, and at the extraction sites, which had a bigger proportion of species living at the surface level. A general trend is the shift towards a dominance of small-bodied, short-lived species without a larval stage.

The different types of impacts and levels of disturbance provided the ideal platform to assess the potential of biological trait-based indicators. While responses appear to be complex and case-dependent, results from this study show that the implementation of this type of analysis should be considered as a complementary tool in future environmental impact assessments.

Keywords

macrobenthos, dredging, sand extraction, offshore wind farms