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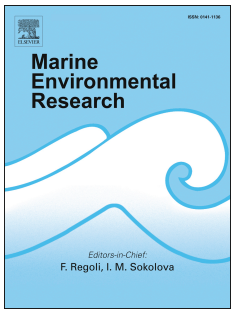

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Environmental niche separation between native and non-native benthic invertebrate species: Case study of the northern Baltic Sea

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ABSTRACT

Knowledge and understanding of geographic distributions of species is crucial for many aspects in ecology, conservation, policy making and management. In order to reach such an understanding, it is important to know abiotic variables that impact and drive distributions of native and non-native species. We used an existing long-term macrobenthos database for species presence-absence information and biomass estimates at different environmental gradients in the northern Baltic Sea. Region specific abiotic variables (e.g. salinity, depth) were derived from previously constructed bathymetric and hydrodynamic models. Multidimensional ordination techniques were then applied to investigate potential niche space separation between all native and non-native invertebrates in the northern Baltic Sea. Such an approach allowed to obtain data rich and robust estimates of the current native and non-native species distributions and outline important abiotic parameters influencing the observed pattern. The results showed clear niche space separation between native and non-native species. Non-native species were situated in an environmental space characterized by reduced salinity, high temperatures, high proportion of soft seabed and decreased depth and wave exposure whereas native species displayed an opposite pattern. Different placement of native and non-native species along the studied environmental niche space is likely to be explained by the differences in their evolutionary history, human mediated activities and geological youth of the Baltic Sea. The results of this study can provide early warnings and effectively outline coastal areas in the northern Baltic Sea that are prone to further range expansion of non-native species as climate change is expected to significantly reduce salinity and increase temperature in wide coastal areas, both supporting the disappearance of native and appearance of non-native species.