

Evaluating the pressure from bottom trawling to vulnerable marine ecosystems (VMEs) in the Nordic Seas

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In the deep waters of the Nordic Seas, several benthic habitats have been classified as vulnerable marine ecosystems (VMEs) including cold-water coral reefs, coral gardens, and deep-sea sponge aggregations. The main immediate threat to VMEs are commercial fisheries using bottom trawls. Evaluating the spatial overlap between areas with VMEs and bottom trawling is challenging, as the distribution of VMEs is poorly known given the difficulties in obtaining direct observations of the seafloor. Recently, Habitat Suitability Models (HSMs) have been used to predict the distribution of deep-sea species or habitats, although the use of predicted VME distributions in management applications is still limited.

The NovasArc project (2016-2018) modelled the distribution of 11 VMEs present in the Nordic Seas using MaxEnt and an array of environmental datasets as predictors. Spatially-explicit estimates of the precision of the predictions were obtained using a bootstrap method. Fishing intensity was mapped using data from vessel monitoring systems and automatic identification systems. Areas potentially at risk were identified by classifying the study area according to the habitat suitability, fishing intensity and level of uncertainty and then examining the overlap in the fishing effort and the predicted distribution of VMEs. The degree of overlap ranged from low in deep-arctic sponge aggregations (8.5%) to high in stylasterid corals (37.6%), and varied significantly at the regional level. The maps of the spatial overlap between predicted VME distribution and fishing effort produced by the NovasArc project provide valuable information for the conservation of deep-sea VMEs.

Keywords: Vulnerable Marine Ecosystems, indicator species, species distribution models, bottom trawling, spatial risk assessment, uncertainty

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