

Predicting the distribution of deep-sea habitats: what can be gained from using detailed epibenthic data and high-resolution predictors?

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Abstract

In order to preserve marine ecosystems, it is necessary to have knowledge of the distribution of different types of habitats and ecosystems, so that they can be represented within marine protected area networks. Due to a scarcity of benthic ecological data, this knowledge is difficult to obtain. Habitat distribution models play a key role in bridging this gap. However the extent to which these can support marine spatial management depends on the quality of the model input data including field observations and environmental descriptors. This study demonstrates a reproducible method for investigating the distribution of deep-sea sponge aggregations in the Barents Sea, where marine managers are interested in defining the exact locations and boundaries of patches of this habitat.

The epibenthic data is derived from underwater video footage, under the MAREANO (Marine AREA database for NORwegian waters) Programme. Through detailed video analysis all megafaunal taxa are identified and counted, and all annotations georeferenced.

Conditional inference forest models are used to extend the observational data and predict the occurrence of sponge aggregations at two resolutions (medium/800m, high/200m) allowing a nested interpretation of this habitat over a large area. Community composition data is used to fine-tune the models.

In Norway this habitat can be divided into three separate, coherent types of habitat: hard-bottom sponge aggregations, soft-bottom sponge aggregations (Ostur), and deep cold-water sponge aggregations. We find the medium-resolution model gives a sense of the overall distribution of the habitat, while the high-resolution model can pin-point candidate locations for targeted spatial management measures.

Keywords:

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