Combining landscape ecology and species-environment relationships for improved high-resolution habitat mapping in the deep sea

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Creation of habitat maps, describing both biotic and abiotic components of marine ecosystems, is an important step for effective management. However, collecting biological information is time consuming and full coverage cannot usually be achieved. Examining species-environment relationships is of interest as environmental characterization is facilitated by acoustic surveys. To create habitat maps, fine-scale species-environment relationships can be modelled and used to map out species distributions, or bathymetric and backscatter maps can be classified into 'regions' of similar acoustic signatures for which characteristic species are identified. In this study, we combined both approaches. Sediment interpretation maps were created using sidescan sonar information collected with an automated underwater vehicle on the Rockall Bank, NE Atlantic. Megabenthic invertebrate abundances were extracted from imagery transects collected by a remotely operated vehicle. We used canonical ordination techniques to examine the relationships between fine-scale sediment characteristics extracted from the imagery as well as landscape metrics describing the patch mosaic structure of the area surrounding each image, derived from the sediment interpretation maps. We found fine-scale sediment characteristics to explain 42% of the variation in species composition. However in the absence of such information, landscape descriptors of sediment interpretation maps explained 18% of the variation, and their spatial arrangement provided information regarding areas of higher biodiversity. As one of the rare landscape ecology studies performed in deeper marine environments, our study suggests that it is not only the fine-scale environmental relationships which are of importance, but also the broader spatial context in which habitat patches are present.