Hierarchical Modelling of Species Communities (HMSC) of benthic species, Potter Cove, King George Island, Antarctica

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Understanding the distribution and coexistence patterns of (benthic) species in Antarctic ecosystems is crucial for the estimation of present and future carbon turnover, ecosystem management, and conservation. Spatial and predictive modeling of environmental and biological data becomes more and more important at remote places to understand and to observe the ecological response to global climate change. In our study, we use the Hierarchical Modelling of Species Communities (HMSC) to model the distribution and coexistence of benthic species based on ecological data. The approach implements a Bayesian framework with Gibbs 'Markov chain Monte Carlo' sampling, and enables to assess the influence of phylogenetic information on species distribution patterns. The HMSC at Potter Cove, West Antarctic Peninsula (WAP), includes a variety of environmental variables, such as water temperature, salinity, bathymetry, distance to the glacier, sediment grain size, suspended particulate matter, and current velocity, among others. As a result, we present habitats for selected benthic communities in prediction maps, and we provide the species composition and spatial variability within the study area. We identify the environmental variables with the highest impact on the benthic community distribution, pinpointing the critical ecological factors in times of climate change. And we learn about the species coexistence patterns, the role of species interactions, and phylogenetic relationships in shaping community structures. The application of HMSC at Potter Cove contributes to the estimation of coastal blue carbon at the WAP, and thus to better coastal conservation planning for Polar regions.

241 words