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TITLE: The importance of different spatial scales in determining structural and functional characteristics of deep-sea infauna communities

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ABSTRACT:

Abstract. The urge to understand spatial distributions of species and communities and their causative processes has continuously instigated the development and testing of conceptual models in spatial ecology. For the deep sea, there is evidence that structural and functional characteristics of benthic communities are regulated by a multitude of biotic and environmental processes that act in concert on different spatial scales, but the spatial patterns are poorly understood compared to those for terrestrial ecosystems. Deep-sea studies generally focus on very limited scale ranges, thereby impairing our understanding of which spatial scales and associated processes are most important in driving structural and functional diversity of communities. Here, we used an extensive integrated dataset of free-living nematodes from deep-sea sediments to unravel the importance of different spatial scales in determining benthic infauna communities. Multiple-factor multivariate permutational analyses were performed on different sets of community descriptors (structure, structural and functional diversity, standing stock). The different spatial scales investigated cover two margins in the northeast Atlantic, several submarine canyons/channel/slope areas, a bathymetrical range of 700?4300 m, different sampling locations at each station, and vertical sediment profiles. The results indicated that the most important spatial scale for structural and functional diversity and standing stock variability is the smallest one; infauna communities changed substantially more with differences between sediment depth layers than with differences associated to larger geographical or bathymetrical scales. Community structure differences were greatest between stations at both margins. Important regulating ecosystem processes and the scale on which they occur are discussed. The results imply that, if we are to improve our understanding of ecosystem patterns of deep-sea infauna and the relevant processes driving their structure, structural and functional diversity, and standing stock, we must pay particular attention to the small-scale heterogeneity or patchiness and the causative mechanisms acting on that scale.

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