Predictive value of trait-based measures for benthic secondary production in the German North Sea

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Understanding the role of biodiversity for ecosystem functioning has become a central research theme in marine ecology. Benthic communities with a higher diversity have been suggested to operate more effectively, which could be quantifiable as a higher secondary production. However, there is no general ecological relationship between diversity and production, not only due to environmental influences, but also because of species-specific effects.

Functional diversity has been identified as the key to understanding the link between biodiversity and ecosystem functioning. We are taking a trait-based and large-scale observational approach to relate patterns in macrofaunal secondary production to functional diversity in the southern North Sea, where benthic macrofauna is confronted with many natural and anthropogenic stressors. Functional diversity is expressed in indices based on dissimilarities of species traits such as feeding type, environmental position, and larval development. Production is calculated with taxon-specific empirical productivity models.

Patterns of functional diversity were spatially more homogeneous than taxonomic diversity. A handful of species provided the majority of the secondary production. Spatially implicit regressions are used to analyze how secondary production is related to environmental factors and trait diversity. We explore further whether models are improved by including specific key traits potentially contributing to energy flow.

Knowledge on the explanatory value of trait composition for maintaining productivity in our system is needed to explore scenarios of anticipated changes in diversity.

Keywords: biodiversity; ecosystem functioning; functional diversity; macrozoobenthos; productivity map