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Application of macroecology theory in marine microbial oceanography and the reciprocity of hypothesis-generating and hypothesis-driven research

Ilka Hanski developed the core- and satellite hypothesis in macroecology based on observations of bimodal occupancy-frequency distributions, i.e. the number of species occupying different number of sites, of different organisms ranging from insects to plants. The core- and satellite hypothesis mechanistically explains the correlations between local abundance and regional occupancy and predicts a mode of many satellite species occupying a single site and a few core species occupying many sites. Here we introduce this metapopulation theory in marine microbial ecology and test if the core- and satellite hypothesis can be used to define biogeographical regions at different spatial scales from the Tara oceans and Malaspina global transects. We also evaluate occupancy-frequency patterns within Longhurst’s biome- and province framework and for modeled phytoplankton species-abundance patterns at global scales. We propose that the lack of bimodal patterns may reflect dispersal limitation due to changes in environmental conditions, and could therefore be advantageous in monitoring and marine management.

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