

"Diversity, functional similarity and top-down control drive synchronization and the reliability of ecosystem function"

Barbara Bauer, Matthijs Vos and Ursula Gaedke
GEOMAR, Helmholtz Centre for Ocean Research Kiel

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The concept that diversity promotes reliability of ecosystem function depends on the pattern that community-level biomass shows lower temporal variability than species-level biomasses. However, this pattern is not universal. First, it relies on compensatory or independent species dynamics. When in contrast synchronization occurs, variability of community biomass will approach towards population-level variability. Present knowledge fails to integrate how species richness, functional diversity and the relative importance of predation and competition combine to drive such synchronization at different trophic levels. Second, the effects of diversity on functional reliability will change when different numbers of species make species-specific contributions to different ecosystem functions. Here we address both these issues, showing 1) which mechanisms drive synchronization in diverse communities, and 2) how synchronization affects temporal reliability of different types of ecosystem function. We explain how strong top-down control by generalist predators promotes synchronization at both trophic levels, whereas bottom-up control promotes compensatory dynamics in prey and either synchrony or compensation among predators, depending on their functional diversity. Importantly, the effects of synchronization on reliability of function follow a different pattern for ecosystem functions provided by predators and prey. Understanding diversity-function relations requires insight into the respective drivers of synchrony and compensation.