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Food-web constraints on biodiversity–ecosystem functioning relationships

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Abstract

The consequences of biodiversity loss for ecosystem functioning and ecosystem services have aroused considerable interest during the past decade. Recent work has focused mainly on the impact of species diversity within single trophic levels, both experimentally and theoretically. Experiments have usually showed increased plant biomass and productivity with increasing plant diversity. Changes in biodiversity, however, may affect ecosystem processes through trophic interactions among species as well. An important current challenge is to understand how these trophic interactions affect the relationship between biodiversity and ecosystem functioning. Here we present a mechanistic model of an ecosystem with multiple trophic levels in which plants compete for a limiting soil nutrient. In contrast to previous studies that focused on single trophic levels, we show that plant biomass does not always increase with plant diversity and that changes in biodiversity can lead to complex if predictable changes in ecosystem processes. Our analysis demonstrates that food-web structure can profoundly influence ecosystem properties.

Footnotes

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Complex food webs prevent competitive exclusion among producer species

Proc R Soc B (Proceedings of the Royal Society B: Biological Sciences) 2008 275 (1650) 2507-2514

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Science (Science) 2008 319 (5865) 952-954

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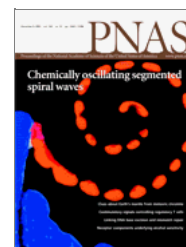
ECOLOGY: Food Web Ecology: Playing Jenga and Beyond

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