Abiotic resource variability regulates ecosystem multifunctionality and is moderated by food-web structure

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Abstract

Many aspects of global change destabilise abiotic resource dynamics. The ecological consequences of this enhanced environmental variability are, however, largely unknown and may be mediated by the organisation of food-web interactions. To explore this, we enriched freshwater ponds experimentally with nutrient pulses of varying temporal patterns, but with the same overall resource supply, and examined whether the presence of fish predation can moderate the effects of enhanced resource variability. We found that different temporal patterns of resource supply altered different ecosystem functions in different ways. Further, we show that the presence of predation can partly buffer ecosystem functioning against enhanced resource variability and, moreover, reduce the heterogeneity of multifunctional responses among ecosystems. We conclude that predicted global shifts in patterns of environmental variability, particularly when coupled with the loss of predator species, have the potential to alter the overall functioning of ecosystems in many previously unanticipated and largely unpredictable ways.