Biodiversity and ecosystem functioning under global change - Meta-analysis of litter decomposition and consumer diversity responses across global change drivers

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Abstract

Environmental change affects ecosystem functioning through both biotic and abiotic processes. The biodiversity-mediated effect of global change on ecosystem functioning has received a lot of attention in ecological literature, mostly based on experiments manipulating biodiversity directly and randomly. Yet, under the influence of environmental change, the importance of the biodiversity-mediated effects could be offset by non-random shifts in biodiversity, changes in community composition and in species contributions to function, and abiotic processes. It is thus crucial to re-introduce environmental change into biodiversity-ecosystem functioning research.
In this synthesis, we focused on litter decomposition as a key process fueling ecosystems, and jointly determined by the diversity of saprotroph organisms and by abiotic factors sensitive to the influence of environmental change drivers. We aim to quantify the relative magnitude of the biodiversity-mediated effect on litter decomposition of a range of global change drivers, including chemical stressors that are currently overlooked drivers of global change. We used data from published records that measured the impact of two contrasting types global change drivers; resources (nutrient, CO2) and stressors (chemicals,acidification,warming,drought) on both consumer diversity and litter decomposition. We assume that the two types of drivers have different effects with stressors decreasing both biodiversity and function, while resources are predicted to decrease biodiversity but to increase function.
Using the correlation between biodiversity and decomposition within study as an effect size, preliminary results show the contrasting impacts of resource enrichment (no overall diversity-function relationship) and chemical stressors (significant positive relationship). We will use structural equation modeling of the responses of decomposition and diversity to environmental change intensity to quantify the relative magnitude of the biodiversity-mediated effect. These findings represent an important conceptual advancement in biodiversity-ecosystem functioning research by re-introducing the environmental factors that drive biodiversity in the first place, providing crucial insights for both scientific and management purposes.

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