

Letters to Nature

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Partitioning selection and complementarity in biodiversity experiments

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The impact of biodiversity loss on the functioning of ecosystems and their ability to provide ecological services has become a central issue in ecology. Several experiments have provided evidence that reduced species diversity may impair ecosystem processes such as plant biomass production^{1, 2, 3, 4, 5}. The interpretation of these experiments, however, has been controversial^{6, 7, 8, 9, 10, 11, 12} because two types of mechanism may operate in combination^{6, 13, 14, 15}. In the 'selection effect', dominance by species with particular traits affects ecosystem processes. In the 'complementarity effect', resource partitioning or positive interactions lead to increased total resource use. Here we present a new approach to separate the two effects on the basis of an additive partitioning analogous to the Price equation in evolutionary genetics^{16, 17, 18, 19}. Applying this method to data from the pan-European BIODEPTH experiment⁴ reveals that the selection effect is zero on average and varies from negative to positive in different localities, depending on whether species with lower- or higher-than-average biomass dominate communities. In contrast, the complementarity effect is positive overall, supporting the hypothesis that plant diversity influences primary production in European grasslands through niche differentiation or facilitation.

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