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Regular Article

COMMUNITY DISASSEMBLY, BIODIVERSITY LOSS, AND THE EROSION OF AN ECOSYSTEM SERVICE

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Distinguishing the mechanisms responsible for the relationship between biodiversity and ecosystem services requires knowledge of (1) the functional roles played by individual species and (2) the sequence with which species are added to or lost from communities in nature (i.e., “community assembly” and “community disassembly,” respectively). Rarely, if ever, are both these issues understood with certainty in any given ecosystem. We used an empirically based simulation model to assess the degree to which the sequence of species loss from vertebrate communities influences risk of human exposure to Lyme disease, as measured by the proportion of ticks infected with the etiological agent. Dramatic differences in the shapes of the curves relating vertebrate biodiversity to disease risk (which we consider an ecosystem service) were observed. Randomized sequences of species loss resulted in a decrease in disease risk with reduced biodiversity, a result that is contradicted by both empirical observations and model results from nonrandomized sequences of species loss (i.e., specific “disassembly rules”). All potentially realistic disassembly rules resulted in increases in disease risk with decreasing biodiversity, although shapes of the curves varied considerably. Our results highlight the importance of both species identity and the order by which species are lost, in understanding the mechanisms by which biodiversity affects ecosystem functioning.

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