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Challenges to linking trait patterns and competition processes

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a) Background/Questions There is no shortage of proposed mechanisms to account for coexistence in the face of competition for limited resources. Most involve some sort of niche partitioning, i.e. species differences stabilize coexistence by providing a fitness advantage to rare species. A fundamentally different explanation is that co-occurring species can live together for a certain amount of time before weaker competitors are replaced by stronger ones, and more similar species take longer to sort each other out. In response, one recent goal in the coexistence literature has been to parse how strongly niche processes drive community assembly and maintain biodiversity. To that end, the study of species traits has been promoted, as there seems to be a natural connection between niche assembly and trait dispersion : a niche-regulated community should display some form of limiting similarity, i.e. differences among coexisting species should be larger than could be explained by chance. However, compilations of early trait work report evidence supporting niche partitioning in less than half of the total published studies, and the more recent literature does not seem to bring much better news. Here we consider why traits-based approaches have failed to provide strong evidence for niche assembly, and whether better methodologies can be designed to glean the influence of niche mechanisms in shaping trait patterns. b) Conclusions We highlight three key issues presented in recent literature which call for revisions to baseline expectations of limiting similarity : i) the potential for clumps of similar species that appear in transient regimes of niche models and can be maintained indefinitely by immigration, ii) the presence of sometimes large amounts of intraspecific variation, and iii) the need to focus on spatial scales at which a particular process of interest is expected to operate and wherefore patterns are expected to be strongest. We discuss how these affect expectations of trait dispersion and the power of tests, and point out ways to address these issues. While acknowledging that traits-based methods may ultimately prove to have limited potential to provide evidence for niche assembly, we conclude that the development of models that incorporate intraspecific variation from the get-go and provide scale-specific predictions, allied with more sophisticated metrics of dispersion combining traits to species abundances, may pave the way to stronger detection of patterns indicative of niche processes.

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