

Co-occurrence is not evidence of ecological interaction

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Abstract

There is a rich amount of information in co-occurrence data that could be used to understand community assembly. This proposition first envisioned by Forbes (1907) and then Diamond (1975) prompted the development of numerous modelling approaches (e.g. null model analysis, co-occurrence networks and, more recently, joint species distribution models). Both theory and experimental evidence support the idea that ecological interactions may affect co-occurrence, but it remains unclear to what extent the signal of interaction can be captured in observational data. The time is now ripe to step back from the statistical developments and critically assess whether co-occurrence data really is a proxy for ecological interactions. In this paper we present a series of arguments based on probability, sampling, food web and coexistence theories supporting that significant spatial associations between species (or the lack of) is a poor proxy for ecological interactions. We discuss appropriate interpretations of co-occurrence, along with potential avenues to extract as much information as possible from such data.

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