

Avoiding artifacts when varying the number of species in ecological network models

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Abstract

Ecological theory recognizes the importance of the variety of species for maintaining the functioning of ecosystems and their derived services. We assert that when studying the effects of shifts in biodiversity levels using mathematical models, their dynamics must be sensitive to the variety of species traits but not to raw species numbers, a property that we call scale-invariance. We present a testing procedure for verifying scale-invariance of ecological network models—with or without trait adaptation—expressed as ODEs. Furthermore, we applied our test to several influential models used for evaluating biodiversity effects on ecosystem functioning. In most of the surveyed studies the equations failed our test. This raises doubts about the validity of previous results and calls for revisiting the theory derived from these studies. Our results foster the creation of artifact-free models, a necessary step towards building a more robust theory of biodiversity-driven ecosystem functioning.

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