

Avoiding scale induced artifacts in eco-evolutionary 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. In this context, adaptive changes in functional traits plays a crucial role. We assert that when studying the effects of shifts in biodiversity levels using mathematical models, they must be scale-invariant, i.e., should be sensitive to the variety of species traits but not to raw species numbers. We present a testing procedure for verifying scale-invariance of eco-evolutionary network models 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 used 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 ecosystem functioning.

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