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A modelling framework to open the gates of assemblage structure

There is a known disagreement between the results of species distribution models (SDM) and those of macroecological models (MEM) of community structure. While SDM usually predict that assemblages hold more species than they actually do, MEM tend to underestimate these numbers. In a bold proposal, Guisan and Rahbek use such disagreement to provide a new framework to study (and predict) changes in assemblage structure. Building on examples of the SDM-MEM discrepancy, they propose SESAM, a modeling framework for spatially explicit species assemblage modelling.

SESAM is based on the idea of applying successive filters to account for the selection of species from the regional source pool – equivalent to the regional community advocated by Ricklefs – to the local community. Only the formation of the regional source pool from the global pool where the species are 'produced' in evolutionary time is missing from the framework. In successive steps Guisan and Rahbek distinguish the effects of (i) evolutionary history and dispersal, which determine the species source pool (i.e., those species that could colonize the locality in ecological time); (ii) abiotic habitat filters, which determine the presence of species within a particular landscape; and (iii) biotic filters that determine the actual composition of the local community in a given moment of time. According to SESAM, SDM can be used to model the effect of abiotic habitat filters, and MEM would provide a way of identifying the constraints to coexistence imposed by the amount of resources, productivity or habitat diversity of the locality (i.e. its carrying capacity). Which species – from those identified through SDM – are actually present in the locality will then be determined by ecological assembly rules (that within SESAM constitute the second part of the biotic filters).

It is likely that many researchers will disagree on particular methodological recommendations or on the adequacy of choosing certain terms to refer to particular processes or concepts. But, leaving apart these eventual disagreements, the simplicity and comprehensiveness of the approach proposed by Guisan and Rahbek make it hard to find conceptual cracks in their basic arguments or the hierarchy of processes they advocate. Further than its utility as a modelling framework, the integrative perspective offered by SESAM may help revive the debate on how the different determinants of the distribution and co-existence of species together give rise to the geographical patterns of diversity.

Guisan, A. & Rahbek, C. (2011) SESAM – a new framework integrating macroecological and species distribution models for predicting spatio-temporal patterns of species assemblages. Journal of Biogeography, 38, 1433-1444. doi:10.1111/j.1365-2699.2011.02550.x

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