

The role of spatial structure in metacommunity dynamics

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Research Group: [Complex Systems & Networks](#)

Project description:

Metacommunity ecology studies spatial networks of patches, in which each patch harbours an ecological community of interacting species. A central question in the field is to what extent presence/absence and the abundances of species in a patch are determined by the suitability of the local abiotic environment for these species, the abundance of other species in that patch, or by dispersal (diffusion) of this species' population from surrounding patches. Correlative analyses of empirical data yield inconclusive results. Numerical models of metacommunities display patterns of rigid core- and neighbouring satellite communities, but also of the sudden emergence of populations far from any neighbouring hub. There are indications for a phase transition. This raises the question: when and to what extent is the spatial structure of dispersal crucial for the distribution of populations over metacommunities, when can it be disregarded? The question is of central importance for the design of reserve networks, systems of dispersal corridors, and the formulation of biopollution legislation. The main aim of this project is to investigate meta-population dynamics with the help of methods coming from network science. In particular, the project will focus on the numerical and analytical quantification of correlations and heterogeneity in the distribution of species across the patches of a multi-species ecological system with predatory dynamics, and on the role played by population heterogeneity on the emergence of stable configurations where a substantial number of species will survive and prosper. We will also investigate the importance of the spatial constraints imposed by the network of patches, and will compare the solutions with those expected in a variety of meaningful null-models. This project will position the team firmly in the strategic research area of Mathematical Biology, identified in a 2020 EPSRC report as an area of strong growth.

Further information:

[How to apply](#)

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