Persistence of a population in randomly fragmented landscapes

J. Grilli, [1,2], G. Barabas[2], S. Allesina [2]

[1] Dipartimento di Fisica 'G. Galilei'. Università di Padova, Padova

[2] Department of Ecology and Evolution, University of Chicago, Chicago

In a fragmented world, species survival depends on dispersal, as local populations at high risk of extinction could be rescued by immigration from neighboring populations. This intuition forms the core of metapopulation models:[?,?] even though local populations occupying suitable habitat patches might undergo extinction, persistence can be achieved at the metapopulation level as long as individuals can disperse between patches and thus recolonize empty ones.

We show how Euclidean Random Matrices[?] can be used to study metapopulations dispersing in random fragmented landscapes. We derive a condition for metapopulation persistence analytically, highlighting the dependence on spatial dimension, number of patches, shape of the dispersal kernel, and the variability in patch value. We show that a metapopulation, depending on parameters, can be spatially localized: patches with high likelihood of species presence are all close in space.

References

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