Validation of ecological connectivity model predictions in urban areas: replicated landscape genetic study on the land snail Cornu aspersum

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Abstract

Dispersal plays a major role in many ecological and evolutionary processes. Facilitating dispersal movements, by promoting ecological connectivity (the degree to which the landscape facilitates or impedes movement among resource patches) is considered as a major conservation issue, notably in urban landscapes (expanding strongly impervious and characterized by extreme fragmentation degrees). Functional connectivity can be predicted by modelling techniques such as least-cost path analysis and circuit theory based on resistance maps reflecting the cost to move for an organism though different habitat types. We propose to validate predictions of these two methods with analysis of population genetic structure which reflects the movement of genes or individuals among populations.
The studied species is the land snail, *Cornu aspersum,* common in urban landscape and characterized by spatially-restricted dispersal. The energetic cost of movement being extremely high in terrestrial molluscs, we hypothesize that functional connectivity (integrating habitat type suitability) will be a good predictor of genetic distances between populations.

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Hierarchical and spatially replicated sampling was applied. Around 2000 individuals were collected in 3 different French cities (Rennes, Angers and Lens). In each city, 4 contrasting landscapes with different degrees of ecological connectivity were delimitated and 10 populations were sampled in each landscape. Pairwise genetic distances were calculated from genotypes at 6 polymorphic microsatellite loci.
Correspondences between landscape connectivity and genetic structure were assessed by the degree of correlation between ecological and genetic distances. The performance of each connectivity model through diverse urban contexts is evaluated, highlighting the interest of landscape-genetic coupled approaches.

Keywords: functional connectivity, land snail, microsatellites, genetic structure, urban area