Invasions by polymorphic species

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Two issues of current importance in ecology are the range expansion of species and invasion of exotic organisms. Climate change is affecting the environments that species are currently adapted to, and to survive species will either need to adapt to the new conditions or shift with their current environment. Empirical observations and simulation models have shown that higher dispersal ability may lead to increased rates of spread but little is known about the effect of having a community of dispersal phenotypes on the rate of range expansion. We use a spatially explicit analytical model based on partial-differential equations to investigate the invasion of a species with two dispersal phenotypes into a previously unoccupied landscape. These phenotypes differ in both their dispersal and population growth rate. Using analytical techniques and carrying out numerical simulations in *R* (R Development Core Team, 2010) using the **deSolve** package (Soetaert *et al.,* 2010), we find that the presence of both phenotypes can result in faster range expansions than if only a single phenotype were present in the landscape, and that typically the invasion can occur up to twice as fast as a result of this polymorphism. This has implications for predicting species invasion speeds, suggesting that speeds cannot just be predicted from looking at a single phenotype and that the presence of a community of phenotypes needs to be taken into consideration.

References

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