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Estimation of the stratified dispersal rate

The establishment and spread of invading organisms have dramatic consequences for ecosystems. Many organisms expand their range by being transferred passively over short and long distances simultaneously, thus resulting in a stratified dispersal process [1, 2] . The stochastic events of long-distance dispersal complicate the estimation of the spread rate of an invading population. Our goal is to measure the accelerating effect of secondary foci created by long-distance dispersal on the invasion spread rate. We developed a spatially explicit host-pathogen model describing independently continuous short- and stochastic long-distance dispersal processes. Comparison of exact solutions of diffusive spread with results of Monte Carlo simulations of stratified dispersal allowed us to estimate the impact of long-distance dispersal events on the spread rate. Due to independent description of the two modes of dispersal, the developed model can be parameterized easily and used in epidemiology. The explicit representation of the two-dimensional habitat allows coupling our model with a landscape optimization method to design landscapes unfavorable to fast epidemics spread.

References

[1] Hengeveld, R. 1989. *Dynamics of biological invasions*. Chapman and Hall, London, UK.
[2] Sapoukhina N., Tyutyunov Y., Sache I. and Arditi R. 2010. *Spatially mixed crops to control the stratified dispersal of airborne fungal diseases*. Ecological Modelling **221** 2793–2800.