Dispersal-reproduction trade-offs in spreading populations

Trade-offs between dispersal and reproduction are known to be important drivers of population dynamics, but their direct influence on the spreading speed of a population is not well understood. Using integrodifference equations, we develop a model that incorporates a dispersal-reproduction trade-off which allows for a variety of different shaped trade-off curves. We show there is a unique reproductive-dispersal allocation that gives the largest value for the spreading speed and calculate the sensitivities of the reproduction, dispersal, and trade-off shape parameters.

Uncertainty in the model parameters affects the expected spread of the population and we calculate the optimal allocation of resources to dispersal that maximizes the expected spreading speed. Higher allocation to dispersal arises from uncertainty in the reproduction parameter or the shape of the reproduction trade-off curve. Lower allocation to dispersal arises from uncertainty in the shape of the dispersal trade-off curve, but does not come from uncertainty in the dispersal parameter. Our findings give insight into how parameter sensitivity and uncertainty influence the spreading speed of a population with a dispersal-reproduction trade-off.