DANIEL MUNTHER, York University

Permanence of Two and Three Competing Species

How can species with different dispersal strategies persist?

Our work towards answering this question arose out of studying the evolution of dispersal of two competing species via a Lotka-Volterra reaction-diffusion-advection system. The species are assumed to be identical except for their dispersal strategies which consist of random movement (diffusion) and biased movement (advection) upward along resource gradients. We focus on how spatial variability in the habitat influences competition. A key facet of this relationship is that diffusion creates a mismatch between a species' population density at steady state and the resource function [Cantrell et al., Evolution of dispersal and ideal free distribution, Math Bios Eng., (7) p17-36 (2010)] This led Cantrell et al. (2010), to introduce a conditional strategy which can perfectly match the resource, resulting in the ideal free distribution of the species at equilibrium.

This ideal free strategy (IFS) separates generalists from specialists. Past studies have shown how a generalist and a specialist can coexist under certain conditions on the resource function (i.e. competitive coexistence). We show that for certain nonmonotone resource functions, two specialists can coexist. In addition, we show how three species with the same population dynamics but different dispersal strategies can coexist.