JAMES WATMOUGH, University of New Brunswick

A general settlement distribution for dispersal across patchy landscapes

Many species have a life stage that disperses larger distances than its other stages. For many marine organisms this is a pelagic larval stage. For many familiar insect species, it is an adult stage. Dispersal is across landscapes that are often patchy, with distinct interfaces between suitable and unsuitable habitat for the organism. Some of the central questions in mathematical ecology concern on the effect of patch spacing on persistence and spread of the species. In many analyses, dispersal is modelled by an integral kernel describing the distribution of individuals that survive the dispersal stage. These kernels are complicated by the fact that while dispersing across patchy landscapes, individuals are subject to differential mortality and settlement probabilities in different habitats. These differential rates introduce asymmetries into the kernel. In addition to differential rates across the landscape, individuals may change their behaviour at the patch interfaces. This interface bias may increase or decrease retention within a patch. We extend previous formulations of dispersal kernels with bias at patch boundaries and derive a general multi-exponential dispersal kernel for a patchy landscape with biased movement across patch interfaces. The kernel is piecewise exponential, with coefficients that can be determined by a straightforward matrix product of the patch parameters. We speculate this matrix formulation of the kernel will simplify numerical computations of integro-difference equation models for population dynamics on patchy landscapes.