Mathematical Biology Seminar

Monday, November 26,2018
3 pm – 457 CAB

Jingjing Xu
University of Alberta

Ecology of Dispersal in Metapopulations

A metapopulation is a collection of local populations, connected by the dispersal of individuals. Dispersal plays a key role in the persistence of metapopulations, as the balance between local extinction and colonization is affected by dispersal. Dispersal is also the primary means by which a species' range changes, as well as an important mechanism for reducing competition and breeding among relatives. In this talk, I focus on the ecological aspect of dispersal on metapopulation, and present two pieces of work related to the effect of delayed dispersal in metapopulations.

The first one focuses on how dispersal may disrupt the social structure on patches from which dispersers depart. Examinations of bifurcation diagrams of the dynamical system show that a metapopulation will, in general, be either in the state of global extinction or persistence. The key finding is that dispersal, and the state changes associated with dispersal, have significant qualitative and quantitative effects on long-term dynamics only in a narrow range of parameter space, so life-history features other than dispersal (e.g., mortality rate) have a greater influence over metapopulation persistence.

The second one asks whether the effort intending to enrich the metapopulation could always promote the persistence of metapopulations, incorporating time delays into the ODE models by Levins and Hanski. Investigations of critical delays and the absolute stability of equilibrium in DDE models show that: 1) delays associated with dispersal only cannot destabilize the population; 2) reducing local extinction in metapopulations with delays associated with available territories or establishment may lead to oscillations; 3) metapopulations with a structure based on the quality of occupied patches suffer less from the problem described in 2) caused by establishment delays.