You are invited to attend the presentation of the

Final PhD Defense
of
Nathan Marculis

Date September 13, 2019

Time 12:00 p.m.

Location CAB 449B

"Integrodifference models for neutral genetic patterns and trade-offs in ecology"

Integrodifference equations are a common tool used in ecology in model the spread of populations. In this thesis, we explore the neutral genetic patterns formed by range expansions and how dispersal-reproduction trade-offs impact the spread of populations. To understand the formation of neutral genetic patterns we analyze the inside dynamics of integrodifference equations. To begin, we consider how various growth functions and dispersal kernels affect the neutral genetic spread of a population. Next, we extend the model to include stage-structure and show that the population structure can influence these neutral genetic patterns. In addition, we derive a mutation model and discuss the effect of mutations on the neutral genetic patterns. Next, we construct a model that incorporates a dispersal-reproduction trade-off effect that 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 form uncertainty in the shape of the dispersal trade-off curve, but does not come from uncertainty in the dispersal parameter.