Mathematical Biology Seminar

Friday, October 4, 2024

3 pm MDT - 457 CAB (in person)

Join Zoom Meeting

https://ualberta-ca.zoom.us/j/97624718507
Meeting ID: 976 2471 8507

Bo Zhang

Integrative Biology

Oklahoma State University

Movement alters ecological dynamics in heterogeneous environments

Understanding mechanisms of coexistence is a central topic in ecology. Mathematical analysis of models of competition between two identical species moving at different rates of symmetric diffusion in heterogeneous environments show that the slower mover excludes the faster one. The models have not been tested empirically and lack inclusions of a component of directed movement toward favorable areas. To address these gaps, we extended previous theory by explicitly including exploitable resource dynamics and directed movement. We tested the mathematical results experimentally using laboratory populations of the nematode worm, *Caenorhabditis elegans.* Our results not only support the previous theory that the species diffusing at a slower rate prevails in heterogeneous environments but also reveal that moderate levels of a directed movement component on top of the diffusive movement allow species to coexist. Additionally, we have expanded our work to test the outcomes of different movement strategies in a various of fragmented and toxincant environments. For instance, we combine mechanistic mathematical modeling and laboratory experiments to disentangle the impacts of habitat fragmentation and locomotion. Our theoretical and empirical results found that species with a relatively low motility rate maintained a moderate growth rate and high population abundance in fragmentation. Alternatively, fragmentation harmed fast-moving populations through a decrease in the populations' growth rate by creating mismatch between the population distribution and the resource distribution. Our study will advance our knowledge of understanding habitat fragmentation's impacts and potential mitigations, which is a pressing concern in biodiversity conservation.