University of Miami
Institute for Theoretical and Mathematical Ecology
in cooperation with the
Department of Mathematics
College of Arts and Sciences

Colloquium

Professor Rogr Arditi

Department of Ecology and Evolution
Université Pierre et Marie Curie, Paris

will present

“How Species Interact”

Friday, February 3, 2012
5:00- 6:00 pm, Ungar Bldg. rm 402

Refreshments served at 4:30 p.m. in CC 521

Abstract

Understanding the functioning of ecosystems requires the understanding of the interactions between consumer species and their resources. How do these interactions affect the variations of population abundances? How do population abundances determine the impact of predators on their prey? The authors defend the view that the "null model" that most ecologists tend to use (derived from the Lotka-Volterra equations) is inappropriate because it assumes that the amount of prey consumed by each predator is insensitive to the number of conspecifics. The authors argue that the amount of prey available per predator (rather than the absolute abundance of prey) is the basic determinant of the dynamics of predation. This so-called ratio dependence is shown to be a much more reasonable "null model". Lessons can be drawn from a similar debate that took place in microbiology in the 1950's. Currently, populations of bacteria are known to follow the analogue of ratio dependence when growing in real-life conditions. Three kinds of arguments are developed. First, it is shown that available direct measurements of prey consumption are "in the middle" but most are close to ratio dependence and all are clearly away from the usual Lotka-Volterra relationship; an example is the system of wolves and moose on Isle Royale. Second, indirect evidence is based on the responses of food chains to nutrient enrichment: all empirical observations at the community level agree very well with the ratio-dependent view. Third, mechanistic approaches explain how ratio dependence emerges at the global scale, even when assuming Lotka-Volterra interactions at the local scale; this is illustrated by microcosm experiments, by individual-based models and by mathematical models. Changing the fundamental paradigm of the predator-prey interaction has far-reaching consequences, ranging from the logical consistency of theoretical ecology to practical questions of eco-manipulation, biological control, conservation ecology.

This work is in collaboration with Lev Ginzburg.