Principles of Population Biology
Population Biology 200A
Fall 2017

In solving ecological problems we are concerned with what animals do in their capacity as whole, living animals, not as dead animals or as a series of parts of animals. We have next to study the circumstances under which they do these things, and, most importantly of all, the limiting factors which prevent them from doing certain other things. By solving these questions it is possible to discover the reasons for the distribution and numbers of animals in nature. – Charles Elton in *Animal Ecology* (1927)

Instructor: Sebastian Schreiber

Office Hours: Tuesdays 10:40–11:30am in 5348 Storer Hall

Course Overview: Combining lectures, readings from the empirical and theoretical literature, computer based assignments, and group projects, the first five weeks of this course will provide an overview of the theory of single species ecology. Topics covered will include

- Density dependence
    - negative density-dependence and population regulation
    - positive density-dependence and Allee effects
    - non-equilibrium dynamics and alternative stable states
- Temporal heterogeneity
    - environmental stochasticity
    - population viability analysis
    - life history strategies in random environments
- Individual heterogeneity
    - stage-structured populations and sensitivity analysis
    - Lyapunov exponents and persistence in random environments
    - demographic stochasticity and branching processes
- Spatial heterogeneity
    - metapopulation theory
    - source-sink dynamics
    - dispersal strategies

Additional topics representing the interests of the class will be covered provided there is time.

Class time will be divided between lectures, discussions based on reading assignments from the primary literature, and R driven explorations of theoretical concepts and data sets.

Discussions: At least a day prior to a discussion about a reading assignment, everyone will be expected to post comments/questions about the reading on Canvas. This on-line discussion board will, ideally, prime the pump for the in-class discussion, provide opportunities to get questions answered about unfamiliar terminology or concepts prior to the discussion, and serve as a forum for continued discussion after class. For each reading assignment, there will be a discussion leader who will briefly summarize the reading assignment, keep the discussion moving along, facilitate opportunities for everyone to participate, etc.

R assignments: R is a "state of the art" mathematical and statistical software that can do everything from simulating complex ecological/evolutionary models to performing statistical analyses of data sets. You can download R here. I also recommend downloading the graphic user interface RStudio.

Every week there will be an R assignments that provides you with "hands on" opportunities to explore theoretical concepts and data sets. R tutorials and sample R files will be provided to familiarize you with this software.

Canvas: I will be maintaining a Canvas site for this course. This site will contain up to the date information about the course, assignments, links to other resources available on the web, R files, PDF files of labs and handouts, and discussion board for the readings.