BIOS 454/854 Ecological Interactions
Syllabus and Course Information

Instructor: Dr. Sabrina E. Russo
208 Manter Hall, 472-8387, srusso2@unl.edu

Office hours: By appointment

Course website: Blackboard

Lectures: TBD

Required texts: Morin, Peter J. 2011. Community Ecology, 2nd edition. Blackwell Science.

What are Ecological Interactions?

The phrase, "ecological interactions" describes how individuals of populations and populations of species interact with each other and their environment and includes the fields of population and community ecology. Population ecology addresses the dynamics of populations of one species and how individuals within those populations interact. Community ecology addresses the properties of and patterns in assemblages of species, such as in diversity or function, and what processes or mechanisms give rise to those patterns, such as predation or dispersal. Studying ecological interactions not only can give us insight into how natural communities are "assembled", but also how humanity's modifications to the earth may impact them.

The study of ecological interactions is at an exciting frontier largely because of advances in the tools uses to study populations and communities: Computational and analytical advances allow us to build complex models, allowing stronger linkages between empirical and theoretical approaches. Genomic techniques allow us to investigate ecological interactions and responses on scales that were heretofore intractable. The future holds much promise and opportunity for groundbreaking work by creative thinkers and motivated students! Perhaps for these reasons, there is no modern, definitive textbook in this area. Morin (2011) provides concepts foundational to much of what will be covered in greater depth or from a different angle in lectures and discussions. The "useful texts" listed below serve as supplemental information. Much of what you learn will be from readings in primary literature, which we will cover in detail in student-led discussions.

Goals of this course:

(1) To introduce students to some of the main ideas, concepts, and approaches in the study of ecological interactions and to demonstrate the integrative, multidisciplinary nature of this field.
(2) To learn how to read, evaluate, interpret, and discuss primary literature in population and community ecology and reflect on the scientific impact and conceptual advances that published research provides.
(3) To gain exposure to and experience with quantitative tools commonly used in Community Ecology.
(4) To practice scientific writing and inference both to justify or solidify your ideas and to learn to write and publish scientific papers.
(5) To learn in detail, demonstrate technical proficiency, and reflect upon a particular topic of the students' choice within population or community ecology by reviewing the primary literature, writing a synthetic review paper, and making a lecture presentation to the class on this topic.
(6) To learn to evaluate and reflect upon the impact of scientific papers by conducting a peer-review of class-mates' review paper.

Prerequisites and requirements of this course:

Prerequisites for undergraduate students are BIOS 102, 103, and either BIOS 207 or BIOS 220, or equivalent courses. I expect that you will attend all course meetings, complete assignments, prepare for and participate in discussions, and ask questions in lecture. The material in this course assumes knowledge of general biology and ecology, with some familiarity with basic calculus, algebra, and statistics. Attendance and participation in class are part of your final grade. If you anticipate that you must be absent from a class meeting for a legitimate reason, please speak to me about it before your absence.

ACE 10 Student Learning Outcome

This course satisfies the ACE 10 student learning outcome to generate a creative or scholarly product that requires broad knowledge, appropriate technical proficiency, information collection, synthesis, interpretation, presentation, and reflection. This will be achieved by (1) discussions of primary literature and debates of controversial issues in population and community ecology during class, (2) writing one synthetic review paper and presenting a lecture to the class on a topic within population and community ecology, and (3) conducting peer-reviews of fellow class-mates review papers, which involves reflection on and synthesis of scientific information. See the sections below for details.

Course Details

The schedule of activities and readings for course meetings will be updated on Blackboard. Course meetings will be divided between lectures, discussions, and an in-class computer assignment on phylogenetic comparative methods. PDFs of the assigned readings will be available on Blackboard or will be from Morin (2011). See the Course Schedule for reading assignments.

Assessments:

Debate and Discussion leadership and participation:	20%
Participation in computer exercise:	10%
Semester-long in-class participation & attendance:	10%
Review Paper and Proposal:	30%
Presentation on Review Paper topic:	20%
Peer-review of class-mates' Review Papers:	10%

In-class Discussions: Primary literature will be discussed in class. What are the important research questions in population and community ecology? Which researchers have influenced thinking and development of ecological knowledge and what have they contributed? The discussions will help you learn how to answer these questions and introduce you to more of the primary literature. The goal of discussions is to provide you the opportunity to develop your skills to critically read and evaluate scientific literature, interpret and synthesize data and fundamental concepts in ecology, and understand how these research papers fit within the broader context of the course. Discussions will be student-led. By leading the discussion, you will have the opportunity to think more deeply about topics that are currently being discussed in the lectures. Attendance at discussion class meetings is required and repeated failure to attend will result in a failing course grade. Students should consult

with me in advance when they anticipate an absence.

Some discussions will cover controversial topics in ecology, and papers will be assigned from opposing sides of the debate. See the Discussion Guidelines PDF, posted on BB. In addition, questions to consider for leading discussions are: What are the fundamental contributions of researchers who made the foundational observations for these conflicting views of the community? What ideas or syntheses have helped resolve (or fuel) the controversy? How might remaining disagreement be resolved through additional observations or experiments or methods? Participation and leadership will be assessed based on the level of preparation of the student and the productiveness of the ensuing discussion, including knowledge of the assigned reading, integration of the assigned reading with lecture material covered thus far, and clarity, creativity, and logic of the arguments.

Review Paper, Presentation, and Peer Reviews: The discussions and debates will allow students to develop skills in articulating and synthesize research topics. These skills are essential for them to produce a Review Paper, which is the scholarly product produced in this course. The purpose of this assignment is for the student to investigate a topic in population or community ecology and its body of research in the primary literature and write a comprehensive review that reflects the scientific information that the student gained about the topic. During the 11-13th weeks of the course, each student will also give a 20-minute long Presentation in class, in the style of a lecture, on the topic on which they wrote their Review Paper, followed by a 5-10-minute question/answer session. Students will be required to turn in materials that they used during their Presentation (e.g., Power Point files, handouts), and these will be assessed, along with the spoken presentation itself, for a grade.

The scholarly Review Paper and the associated Presentation will demonstrate that students can collect information on a topic, review and interpret the information, and synthesize the information in written and oral formats. Students will also be expected to evaluate different scientific views and demonstrate that they have a broad knowledge of the research topic that allows synthesis and interpretation of scientific information. Assessment will be based on the thoroughness of the literature review and synthesis, critical evaluation of the literature and of the direction of the research in that topic area, integration with lecture material covered thus far, and clarity or oral or written presentation.

Review Papers should be 10-12 pages (double-spaced) in length, written as a manuscript for publication in the style of the professional scientific journal, *Trends In Ecology and Evolution* (*TREE:* *http://www.trends.com/tree/about.htm#authors*). This manuscript will be submitted to me (the mock "editor" for *TREE*). A proposal for your manuscript, in the form of a provisional title and a 500-1000 word abstract outlining the specific topics your review will cover and justifying why it is of interest to the readers of *TREE*, is required and will be due in the 5th week of the semester. I would be glad to meet with you about your proposed topic before the proposal is due. As the mock-subject editor, I will return comments on your proposed article, along with a grade. The final draft of the review paper will be due in the final week of classes of the semester.

Each student will be assigned two fellow class-mates' Review Papers (anonymously) and will conduct a peer-review of them. Students will evaluate the Review Papers' contributions to the discipline of population or community ecology. The Peer-review Assignment will provide students with the

opportunity to reflect on ecological concepts that they have learned and to evaluate how well those concepts are explained and interpreted in a peer's Review Paper, as well as learn to articulate their assessment of a peer's work in a constructive manner, as in the formal process of professional scientific peer-review. Peer-review Assignments will be assessed based on those learning criteria. I will provide guidance on how to conduct peer reviews in class, but additional information can be found here: http://www.esapubs.org/esapubs/reviewers.htm. I will write to each of you again as mock-subject editor, sending you the student review of your manuscript, along with my own review and notifying you whether or not your manuscript was "accepted for publication" (along with your grade).

Here are some guidelines and ideas to help you choose a topic for your Review Paper and lecture: You can (1) trace the development of concepts in population or community ecology that we are not able to cover (or cover sufficiently) in class or (2) provide synthetic reviews of conceptually-driven empirical research on particular groups of organisms or from particular study sites, biomes, or ecosystems.

You should focus on the conceptually interesting aspects of your topic, especially the fundamental natural patterns, and hypotheses about the biological mechanisms or processes that might explain those patterns, and how researchers have tested among alternative hypotheses. Your topic should interest you – feel free to address a topic directly related to your dissertation research. In fact, this assignment could form the basis for the introduction to your thesis or a review paper you later submit for publication. Your Review Paper should be information-rich and demonstrate the depth of your understanding. Your topic should be interesting to the ecological community (specifically the readers of *TREE*).

For example, you could highlight some of the most important community-level patterns and processes that have been identified from work on a selected group of organisms in a selected location (e.g., Galapagos finches). In this case it would be useful to include both details of the key studies and a synthetic overview. Or, you could choose a process in community ecology, then compare its potential to structure the community across types of organisms or ecosystems (e.g., dispersal limitation in grassland plant species vs. grassland rodents vs. grassland bird species).

Graduate vs. undergraduate student evaluation: Whether the student is an undergraduate or graduate student will be taken into consideration in the grading of all assignments. Although students will be graded on the same numerical scale, as described below, grading of graduate students will involve a higher level of expectation in terms of basic knowledge, understanding, ability to synthesize concepts, and writing and presentation skills.

Grading Scale (% of available points)

A+	97.0 – 100
A	93.0 – 96.9
A-	90.0 – 92.9
B+	87.0 – 89.9
B	83.0 – 86.9
B-	80.0 – 82.9
C+	77.0 – 79.9
C	73.0 – 76.9
C-	70.0 – 72.9
D+	67.0 – 67.9
D	63.0 – 66.9
D-	60.0 – 62.9
F	<59.9%

Other important information:

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.

Other useful texts:

Brown, James. H. and Geoffrey B. West. 2000. Scaling in Biology. Oxford University Press.
Case, Ted J. 2000. An illustrated guide to theoretical ecology. Oxford University Press.
Chase, Jonathan M. and Mathew A. Liebold. 2003. Ecological Niches: Linking classical and contemporary approaches. University of Chicago Press.
Cody, Martin L. and Jared M. Diamond. 1975. Ecology and evolution of communities. Belknap Press.
Diamond, Jared and Case, Ted J. 1986. Community ecology, Harper & Row.
Dodds, W. 2009. Laws, Theories, and Patterns in Ecology. University of California Press, Berkeley, CA
Gotelli, Nicholas J. 2001. A Primer of Ecology, 3rd ed, Sinauer Press.
Gotelli, Nicholas J. and Aaron M. Ellison. 2004. A Primer of Ecological Statistics. Sinauer Press.
Grace, James B. and David Tilman. 1990. Perspectives on plant competition. Academic Press.
Holyoak, Marcel, Mathew A. Leibold, and Robert D. Holt. 2005. Metacommunities : spatial dynamics and ecological communities, University of Chicago Press.
Hubbell, Stephen. 2001. The Unified Neutral Theory of Biodiversity and Biogeography. Princeton University Press.
Huston, Michael A. 1994. Biological Diversity. Cambridge University Press.
Kinzig, A. P., S. W. Pacala, and D. Tilman. 2001. The Functional Consequences of Biodiversity: Empirical Progress and Theoretical Extensions. Princeton University Press.
Losos, J.B. 2011. Lizards in an Evolutionary Tree: Ecology and Adaptive Radiation of Anoles. University of California Press, Berkeley, CA
Losos, J.B., R.E. Ricklefs (eds) 2009. The Theory of Island Biogeography Revisited. Princeton University Press, Princeton, NJ
MacArthur, Robert H. and Edward O. Wilson. 1967. The theory of island biogeography, Princeton University Press.
Magurran, A. E. 2004. Measuring Biological Diversity. Blackwell Science, Inc.
Real, Leslie A. and James H. Brown. 1991. Foundations of Ecology: Classic papers with commentaries. University of Chicago Press.
Resetarits, W. J., Jr. and Bernardo. 1998. Experimental Ecology: Issues and Perspectives. Oxford University Press.
Ricklefs, R.E. and Dolph Shluter. 1993. Species Diversity in Ecological Communities. University of Chicago Press.
Rosenzweig, Michael L. 1995. Species Diversity in Space and Time. Cambridge University Press.
Scheiner, S. M. and J. Gurevitch. 1993. Design and Analysis of Ecological Experiments. 1 edition. Chapman and Hall.
vanStraalen, N.M., D. Roelofs. 2006. An Introduction to Ecological Genomics. Oxford University Press, Oxford, England
Strong, Donald R. *et al.* 1984. Ecological communities: conceptual issues and the evidence. Princeton University Press.
Verhoef, H.A., P.J. Morin (eds). 2010. Community Ecology: Processes, Models, and Applications. Oxford University Press, Oxford, England