BioE 107: ECOLOGY Winter Quarter 2018

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Required textbook: A Primer of Ecology (4th edn.) 2008. Gotelli, N.J. Sinauer Press.

This small paperback focuses on the population (i.e. mathematical) aspects of the course. It is available at the bookstore.

LECTURE SCHEDULE AND READINGS

Tu	Jan 9	Introduction	
Th	Jan 11	Evolution, diversity & biogeography	
Tu	Jan 16	Distributions	
Th	Jan 18	Physiological ecology & body size	
Tu	Jan 23	Behavioral ecology	
Th	Jan 25	Population growth	**Text Ch. 1**
Tu	Jan 30	Intraspecific competition	**Text Ch. 2**
Th	Feb 1	Dispersal & population structure	**Text Ch. 3**
Tu	Feb 6	Population structure & life tables	**Text Ch. 3**
Th	Feb 8	Life histories	
Tu	Feb 13	Life histories	
Th	Feb 15	MIDTERM	
Tu	Feb 20	Interspecific competition	**Text. 100-115**
Th	Feb 22	Interspecific competition/Predation	
Tu	Feb 27	Predation	**Text. 126 -133, 147-152**
Th	Mar 1	Herbivory, parasitism & disease	
Tu	Mar 6	Mutualism & coevolution	
Th	Mar 8	Metapopulations & succession	**Text Ch 4 & 180-182**
Tu	Mar 13	Food webs & island biogeography	**Text Ch. 7**
Th	Mar 14	Species richness and conservation	

COURSE GOALS:

The main goal of this course is to introduce you to the important concepts in ecology. The emphasis will be on ideas, not memorization of a pile of facts. To achieve this, I try to focus on detailed case histories that both illustrate important ideas and exemplify aspects of the scientific process such as good experimental design or clever choice of study system to address a question. Another goal is to foster an appreciation for ecological diversity — accordingly, some of the case histories I discuss are chosen to illustrate the weird and the wonderful. Finally, the goal of the tutorial section is to encourage you to begin to think like ecologists for yourselves. Hopefully, the discussions of journal articles and the lab exercises will help you to develop your skills at critically evaluating evidence for ideas and hypotheses, to begin detecting patterns in nature and generating your own hypotheses for these patterns.

GRADING	% of final grade
Midterm exam:	40%
Final exam:	45%
Discussion section:	15%

The discussion section consists of discussion sections plus three lab exercises. The 15 points for the discussion section come from the following:

Lab exercise 1 (Pattern I):	10 points	**Due Feb 6**	**Revision due March 8**
Lab exercise 2 (Computer I):	1 point		
Lab exercise 3 (Computer II):	1 point		
Lab participation:	3 points		

NOTE: **THERE ARE NO REVIEW SESSIONS**. Work on the study questions as you get them and **come to office hours** if you have any questions or need assistance. If you are unable to make scheduled office hours, contact us to make special arrangements.

NO ELECTRONIC OFFICE HOURS! I do not answer study questions by email — come and see me in person. Check with your TA to see whether they follow this same policy.

Students with disabilities who may need accommodations please see me as soon as possible during office hours or make an appointment to see me by email or telephone.

***Policy on cheating*: PLAGIARISM** is a very serious form of cheating and cheaters may receive a grade of zero for the course. Plagiarism occurs when one uses the exact words or work of others without giving credit, or copies writing out the literature verbatim or near verbatim and submits it as their own (it is also wrong to copy almost directly from an article where only the sentence order or word order has been rearranged -- you must write in your own words!) When writing term papers, essays or reports, it is acceptable, at times, to quote (i.e., copy) small amounts of text verbatim from other sources, *given* that the source is identified and the direct quotation is surrounded by quotation marks. Example: According to Lyon "plagiarism is a very serious form of cheating". Use quotations sparingly, if at all. Most people vastly overuse them.

DISCUSSION AND LAB EXERCISE SCHEDULE

Week 1	Jan 8-12	Walk on main campus (we will meet on main campus)
Week 2	Jan 15-19	Discuss article 1
Week 3	Jan 22-26	Computer Lab I. Done at home. **Due Thursday!**
Week 4	Jan 29-Feb 2	Discuss article 2
Week 5	Feb 5-9	Discuss article 3
Week 6	Feb 12-16	Discuss article 4
Week 7	Feb 19-23	Computer Lab II. Done at home. **Due Thursday!**
Week 8	Feb 26-Mar 2	Discuss article 5
Week 9	Mar 5- Mar 9	Discuss article 6
Week 10	Mar 12-16	Discuss article 7

Lab exercise 1: Ecological pattern and process I. You will identify an ecological pattern based on personal observations around campus or any nearby natural areas during your own time and come up with (i) an ecological hypothesis that could explain the pattern and (ii) propose an experiment that one could do to test the idea. The lab write up will be a **two to three page** report.

Lab exercise 2: Computer population simulations I. This exercise will entail computer simulations of population growth and dynamics based on very simple Excel spreadsheet simulations. By varying important variables of the population equations (models) and examining the consequences for the simulated populations, you will be able to better understand the theory we cover in the classroom. The lab will be done at home or at a computer lab on campus. There is a **worksheet** that you will complete and hand in. The worksheet and Excel modules can be downloaded from the class website. Worksheet is also in the reader.

Lab exercise 3: Population simulations II. We will continue to explore population models using computer simulations. In this second computer lab, we focus on life tables, interspecific competition (Lotka-Volterra models) and predator-prey population dynamics. There is a **worksheet** that you will complete and hand in.

Section Times and Locations (all sections meet in CBB 110)

A	Tuesday 12:25-1:30
B	Tuesday 4:25-5:30
C	Thursday 12:25-1:30
D	Thursday 4:25-5:30

Lab 1: An Ecological Pattern and Process

The goal is help you to begin looking for ecological patterns in the natural world and to start thinking about ecological processes that could account for these patterns. The term 'pattern' is used very broadly and could include features of organisms, populations or communities. As ecologists, when we see a pattern in nature, we ask why the pattern occurs (i.e. what mechanism produced the pattern). A hypothesis is simply one possible explanation (mechanism) that could explain how the pattern arose, we often seek to have several different hypotheses. We make predictions from each hypothesis and we then design experiments to test these predictions. In the first pattern and process exercise you find a pattern and will outline one hypothesis for the pattern, in the second exercise, you will find a different pattern and you will outline two hypotheses for the pattern.

The following examples illustrates this process where a single hypothesis is proposed:

You discover a striking pattern - there are no redwood seedlings under redwoods and you ask "Why?" One hypothesis is that there is too little light under the redwoods for the seedlings. One prediction of this hypothesis is that if light levels were increased, seedlings would grow. This could be tested (in theory) by adding artificial light in an area and then comparing the number of seedlings in these experimental plots to the number of seedlings in control plots without light. Finding more seedlings on the plots with artificial light would support the hypothesis, finding no difference between experimental and control plots would reject the hypothesis.

HOW TO FIND A PATTERN

While walking around campus, the shore or any other semi-natural area, start paying more attention to the plants and animals and begin looking for 'patterns' that lead to the question "why?" Looking for differences among species can be a fruitful way of finding patterns (e.g. comparing trees and bushes, we note that trees are much larger than bushes, which raises the question of why some plants grow as trees and others as bushes). This lab exercise is designed to encourage you to start noticing things that you have until now never really looked at or maybe just accepted without thinking about why such patterns exist. So, try to identify a few patterns that beg the question "Why?" For each pattern you identify, try to come up with a hypothesis for an ecological explanation that could explain the pattern and then try to think of an experiment that could test the idea. When you discover a pattern, hypothesis and idea for an experiment that you are happy with, write the assignment up. Check with Bruce or your TA to make sure you are on the right track.

KEY THINGS TO KEEP IN MIND

Never test your hypotheses with your pattern: Predictions must go beyond the pattern you have detected — otherwise the whole enterprise will be nothing more than **circular reasoning** (i.e. the pattern suggests a hypothesis — the hypothesis is then tested by the pattern that led to the hypothesis). In other words, your experiment should test a possible mechanism causing the pattern. Your experiment should not simply establish the fact that the pattern does exist. Circular reasoning is BAD, BAD, BAD!

THE ASSIGNMENT:

The assignment should be **no more than three double-spaced typed pages long (12 size font)**, and it **must have the following structure** (use the three italicized headings as section heading in your report):

1. ***An ecological pattern***: Describe the pattern you found and why you think it is interesting and relevant. If possible, present the pattern as a graph or chart.

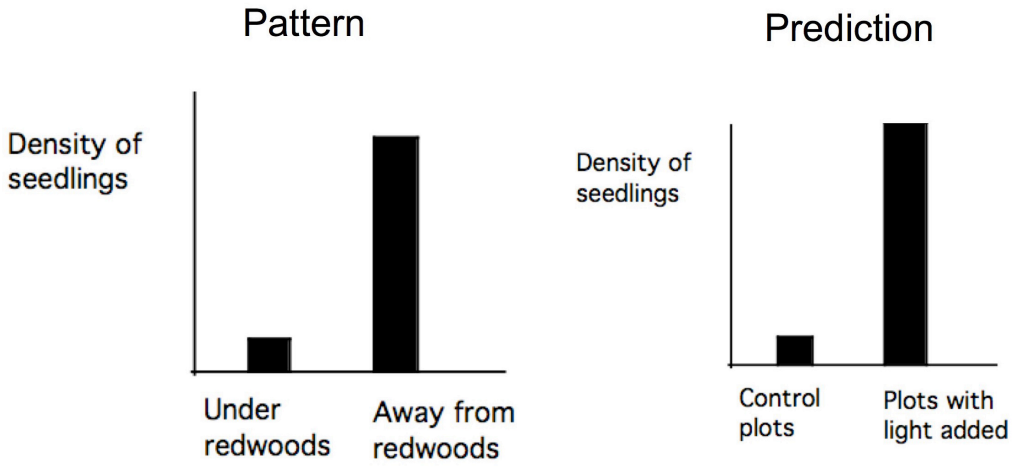
2. ***Hypothesis and prediction****:* Present one hypothesis (mechanism) that could produce the pattern you found and be sure to explain the logic of your hypothesis. Then describe a critical prediction the hypothesis makes. A critical prediction is a prediction that if not observed in your experiment would reject your hypothesis.

3. ***Experiment and predicted results*****:** Describe in detail an experiment that would provide a strong test of the prediction of your hypotheses. Then describe the specific outcome of the experiment that would be consistent with your hypothesis. [Conversely failure to observe the proposed result would reject the hypothesis (assuming the experiment worked!)]. In addition to a verbal description of the results that would support your hypothesis, present the results as a graph or chart (i.e. like real data!) See below for an example. Note: there are many ways to present data in a graph, the example below is just one possibility.

EXAMPLE: This is extremely brief in text mainly to give background for the figure. Your writing should be far more detailed.

Pattern: No seedlings are observed under redwood trees on campus.
Question: Why no seedlings under redwoods?

Hypothesis: There is not enough light for the seedlings to grow.
Prediction: If more light were available, seeds and seedlings would grow.
Experiment: Add artificial light on some plots and compare number of seedlings that grow compared to control plots without light added



Grading Key for Pattern Paper 1

The paper will be graded out of ten but is worth 10 points of the total points in the course but will be graded out of 15 points and then scaled to 10 points.

1. Statement of Pattern (2 points)

- Was the pattern original and interesting?
- Was there an explanation about why the pattern is interesting?
- How 'general' is the pattern in space and time?
- Were the study species or system clearly identified? Location?
- How easily could a reader, using what is written, go out and observe the pattern themselves?

2. Statement of The Hypothesis (2)

- Is the hypothesis for the pattern clearly stated/identified?
- Does the hypothesis relate to the pattern stated above?
- Does the hypothesis identify a causal factor that could shape the observed pattern?

3. Statement of Predictions (1)

- Is the prediction of the hypothesis clearly stated?
- Is the prediction a 'critical' prediction that is specific to this hypothesis?

4. Data and Tests (2)

- Does the experiment provide a clear test of the prediction?
- Is the proposed experiment logistically feasible?
- Are the treatments well planned out and explained: appropriate treatments/replicates, sample sizes, data to be collected, duration of experiments, frequency of data collection, etc.?
- Are potentially confounding factors identified and controlled for?

5. Overall writing quality (3)

- Is the writing clear?
- Are there good topic sentences?
- Is there a logical structure within paragraphs?
- Is correct grammar used?