Biology 314: Ecology and Population Biology

Professor:

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Course web page:

http://www.webpages.uidaho.edu/~snuismer/Nuismer_Lab/314.htm

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Introduction:

Welcome to Biology 314 (Ecology and Population Biology). In broad terms, population biology is the study of ecological and evolutionary processes and their impact on the structure, function, and distribution of groups of organisms. The primary goals of this course are to introduce you to the conceptual and theoretical underpinnings of this exciting field and to familiarize you with the statistical methods used to draw inferences about population level processes. An additional goal will be to illustrate the applied importance of population biology that ranges from the evolution of antibiotic resistance in bacteria to current debates over the role hatcheries should play in conserving shrinking populations of Pacific Salmon. Theoretical underpinnings and applied issues will be presented during lectures and reinforced by exams that focus on critical thinking and problem solving. Statistical methods used to draw inferences about ecological and evolutionary processes will be introduced during lab sections, practiced using simple problem sets, and reinforced through application to realistic data sets.

Course structure:

Course lecture periods will present conceptual material and provide opportunities to ask questions and work through problems likely to appear on exams. All lectures will be posted on the web prior to the scheduled class period. Laboratories will focus on developing the basic statistical skills needed to analyze ecological and evolutionary data and on the writing skills that allow results to be clearly articulated. Labs will be divided into three discrete modules, each of which focuses on the analysis of a particular type of data. Modules will begin with an introductory lecture by your TA where the statistical tools needed to analyze the data are presented. Familiarity with these tools will be developed by working on a simple problem set that will be due in the following lab period. The next phase of each module will introduce a more complex and realistic data set and challenge you to

evaluate support for a particular hypothesis using the new statistical tools you have learned. You will be given two weeks to analyze this data set and prepare a two page written report of your findings (details on the format and content of reports can be found below). During weeks reserved for data analysis, your TA will be present during lab periods to assist you with your data analyses. Because science in the real world is a collaborative enterprise, working in groups to share ideas and approaches to data analysis is encouraged. However, each student must prepare and submit an independently written report. Directly copying other's reports, or even sections of other's reports, is not acceptable.

Exams:

There will be five 1-hour exams given during the semester. Of these five, your best four will count toward your grade. All previously covered material is fair game on each exam, so **each exam is cumulative**. Each exam will consist of five questions of which you must answer four of your choosing. Potential exam questions will be handed out approximately 1 week before each exam and actual exam questions will be very similar to these. Thus, there will be no surprises on the exams. Since one of the five exams can be dropped, a make-up exam will be given only for legitimate and **officially documented** university approved reasons. If you feel an error has been made in the grading of your exam, you must bring this to the attention of your TA or instructor within 5 working days; **no re-grades will be performed after this time**.

Laboratory reports:

The goal of laboratory reports is to clearly and concisely communicate scientific results. Laboratory reports must be prepared using a word processor and turned into your TA by the appropriate due date (see schedule below) as either a hard copy or a standard digital format (i.e., Word or PDF). ***Reports may not exceed two pages and must be prepared using a font of size 10 or greater***. Each report must contain the following sections:

- Summary – Begin your report with a concise summary of your findings. Clearly state the hypothesis being tested, methods used, results found, and an evaluation of support for the hypothesis. The summary should be in bold face type and ***must not exceed 200 words***.

- Introduction – A single paragraph describing the data set and the hypothesis to be tested.

- Methods – One to two paragraphs describing the approach you took to analyze the data. Include details of all statistical tests used and any assumptions made during your analysis.

- Results – One to two paragraphs describing results of your analyses. Provide statistical details (e.g., *p* values and degrees of freedom) where appropriate. Using tables and figures to summarize your results is encouraged, but these must fit within the two page limit for your report. Be sure to explain why each result matters, and how it helps to evaluate support for the hypothesis.

Grading of laboratory reports:

Laboratory reports must be turned in by the date specified in the lab schedule (see table below). These reports will then be graded by your teaching assistant and returned to you within one week

along with detailed comments. If you are unsatisfied with the grade you received, you may revise your report in light of the comments made by your teaching assistant and turn in it again for a re-grade. You are strongly encouraged to discuss the suggestions made by your TA prior to turning in a revision as only one revision is allowed per report. All report revisions must be turned in to your teaching assistant prior to May 8.

Grade breakdown for laboratory reports:

Scientific merit	60 points
Clarity and quality of writing	40 points
Total	**100 points**

Course Grades:

Your grade will be determined based upon the following point distribution:

Best four out of five exams	640
Lab problem sets (3)	60
Lab reports (3)	300
Total	**1,000**

90% of the total points or higher will be an A, 80% of the total points or higher will be a B, 70% of the total points or higher will be a C, etc. The course is not curved, these cut-offs will be strictly applied, and final grades will not be rounded up (or down). In other words, an 89.9% is still a B, not an A.

Learning outcomes:

The primary goals of this course are to introduce you to the conceptual and theoretical underpinnings of ecology and population biology and to familiarize you with key statistical methods used to draw inferences about population level processes. Additional goals will be to illustrate the applied importance of population biology through discussion of topics such as the evolution of antibiotic resistance in bacteria and the role hatcheries should play in conserving shrinking populations of Pacific Salmon and to promote efficient scientific writing.

Lecture and Exam Schedule

Date	Lecture
January 15	What is population biology?
January 20	Properties of populations
January 22	Malthus, Darwin, and natural selection
January 27	Genetic variation
January 29	Natural selection
February 3	Genetic drift
February 5	**EXAM 1**
February 10	Gene flow
February 12	Speciation
February 17	Population growth I
February 19	Population growth II
February 24	Life histories I
February 26	Life histories II
March 3	Niches and geographic range
March 5	**EXAM 2**
March 10	Interspecific competition
March 12	Concepts of predation
March 17	**Spring Break**
March 19	**Spring Break**
March 24	Herbivory and predation
March 26	Parasitism
March 31	Evolution of infectious disease
April 2	Mutualism
April 7	Coevolution
April 9	**EXAM 3**
April 14	Island Biogeography
April 16	Metapopulations
April 21	Communities
April 23	Food Webs
April 28	Applied population biology
April 30	**EXAM 4**
May 5	**Review (Exam return, grade check)**
May 7	**No class**
May 13	**EXAM 5 (10:00-12:00)**

Laboratory Schedule and Important Deadlines

Week	Activity	Due
January 12-January 16	No Lab	
January 19- January 23	No Labs (MLK Day)	
January 26- January 30	Introduction to the Lab and Module 1: Frequencies and G-tests	
February 2- February 6	Introduction to Data Set #1	Problem Set 1
February 9- February 13	Open lab for help with Data Set #1 analysis and report	
February 16- February 20	No Labs (President's Day)	
February 23- February 27	Introduction to Module 2: Means and t-tests	Report 1
March 2- March 6	Introduction to Data Set #2	Problem Set 2
March 9- March 13	Open lab for help with Data Set #2 analysis and report	
March 16- March 20	No Labs (Spring Break)	
March 23- March 27	Introduction to Module 3: Relationships and linear regression	Report 2
March 30-April 3	Introduction to Data Set #3	Problem Set 3
April 6- April 10	Open lab for help with Data Set #3 analysis and report	
April 13- April 17	Open lab for help with Data Set #3 analysis and report	
April 20- April 24	Open lab for help with revisions	Report 3
April 27-May 1	Open lab for help with revisions	
May 4- May 8	No Labs (Dead Week)	
May 5		REPORT REVISIONS DUE