BIOL 612 – Conservation Genetics

College of Charleston
Spring Semester 2017
Dr. Erik Sotka
eriksotka@gmail.com; Grice 208; Phone: 843-953-9191

This course will introduce you to genetic tools and analyses and how they have been applied to habitat conservation, harvesting, captive breeding programs, invasive species, and forensics. The laboratory provides hands-on training of open-source analytical software and published and unpublished datasets.

Required reading: Allendorf, Luikart and Aitken (2013) *Conservation and the Genetics of Populations.* Wiley-Blackwell. (you should be able to get used copies for ~$50)

Lecture For the first two months, there will be ~3 hours of lecture (with a 15 minute break). Thereafter, lectures will be kept to about one hour per week. The rest of the lecture time will be Mini-Lectures and discussion.

Laboratory We are officially in the laboratory for 3 hours per week. The laboratory portion requires computer work.

Grade

- Participation and mini-lecture (25%)
- Weekly homework assignment (25%)
- Final exam - theory and conceptual (25%) - ***Due March 27***
- Final exam - practical (25%) - ***Papers identified by April 3. Oral presentation due April 24***
  - Population structure or breeding program: SNP or microsat
  - Speciation/Hybridization: Phylogenetics

Mini-lectures: Conservation genetics

During the semester, you will generate one mini-lecture (30 minutes each) on a particular topic. The lectures should be thoughtful, organized, and critical of chosen articles. Each lecture should 1) outline the background of what we know and don't know, and why the topic is important (e.g., dispersal of marine fishes, forensic analysis of whale meat) and 2) provide an **in-depth critical review (What did they do? How did they do it? What did they find and how did they interpret it? What are the strengths and weaknesses of the study?)** of at least 3 empirical articles on that topic. The articles should use molecular tools to address your topic. After the lecture, we will discuss the topic for 30 minutes. All other students will read the relevant chapter and any associated articles assigned by the instructor.

The topic choice is yours, but should be related to the general theme of the previous week's lecture. For example, I'll give a general lecture about Dispersal on March 18, and the two Mini-lectures in the following week will need to focus on Dispersal, but there are countless sub-topics that could be used for any one Mini-lecture (e.g., dispersal of parasites; dispersal and marine protected areas; sex-biased dispersal; gene flow in fragmented environments, etc…)

Final exams: A take-home conceptual exam will ensure you understand the basic toolkit and analyses of molecular ecology. A practical exam will ensure you know how to generate analyses that you find in a Molecular Ecology journal. For two of three concepts listed above, you will find an article that 1) is largely focused on the concept and 2) has all (most) of its data freely available at publicly available servers (e.g., Dryad or GenBank). If the data aren't

available, then you can email the corresponding author and ask for the raw dataset. You will then be required to re-generate several (i envision three) analyses that were in the paper. The output is an oral presentation at the end of the semester of the two articles…what was interesting and important about the paper, its principal findings, its weaknesses, etc… You can start this project at any time. By ***April 3*****, you should identify which papers you want to use, and you and I will agree on which figures/tables you are going to regenerate.** These analyses will take time, so don't wait until the last minute to start.

Student Learning Outcomes

1) To understand the strengths and limitations of genetic tools, and how these genetic tools are useful to questions of conservation
2) To understand how to use open-source software in *R* and its use in analyzing population genetics and phylogenetic questions
3) To gain an appreciation of the modern state of the field in conservation genetics
4) To critically read, criticize and discuss peer-reviewed papers

Attendence policies: Attendance is not mandatory, but nearly all lecture and laboratory material will be useful to you in completing the assignments and exams.

Honor Code: We follow all aspects of the College of Charleston Honor Code (see http://studentaffairs.cofc.edu/honor-system/) for details.

American with Disabilities Act: Any persons with disabilities are entitled to access, support, and reasonable accommodations in this course.

Tentative Grading Scale: A: 90-100; B+: 87-89, B: 80-86, C+: 77-79, C: 70-76, F: <70.

Schedule
NOTE: all reading assignments are for the Allendorf et al. book, except where noted.
Freeland = Freeland, Kirk and Peterson 2011 *Molecular Ecology,* 2nd ed. Wiley.

Date	Lecture	Reading	Mini-lecture	Lab
23-Jan-17	Intro; History of Mol Ecol	1-3		no lab
30-Jan-17	Genetic toolkit; HWE	4,5		PopGen 1 - diversity
06-Feb-17	Drift, Ne	6,7		PopGen 2 - Ne
13-Feb-15	selection, multiple loci	8,10		PopGen 3 - coal
20-Feb-17	Fst and structure	9		PopGen 4 - Fst
27-Feb-17	Quantitative genetics, QTL	Freeland 5		QTL
06-Mar-17	Spring Break			Spring Break
13-Mar-17	Inbreeding	13		Inbreeding
20-Mar-17	Hybridization / speciation	16,17		Phylogeography
27-Mar-17	Dispersal and metapop'ns***	15		Assignment tests
03-Apr-17	Conservation breeding***	19	Dispersal	Genetic management
10-Apr-17	Climate change***	21	Conservation breeding	PRACTICAL
17-Apr-17	Forensics and monitoring***	22	Climate change	PRACTICAL
24-Apr-17	Exploited populations***	18	Forensics	PRACTICAL
01-May-17	Invasive species***	20	Exploited populations	PRACTICAL