BIOL 618 – Marine Molecular Ecology
Grice Marine Laboratory – College of Charleston
Spring Semester 2016
Lecture: 9-noon Wednesdays
Laboratory: 2-5pm Wednesdays
Dr. Erik Sotka
eriksotka@gmail.com; Grice 208; Phone: 843-953-9191

This semester-long course will introduce you to genetic tools - which ones are available, practical and useful for particular questions - and how these genetic analyses have been applied to a wide variety of ecological topics. We will focus on marine organisms and issues of dispersal, life histories, recruitment, habitat and mate choice, behavior, natural selection, community ecology, the conservation of biodiversity, and speciation.

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 (led by students: see below).

Laboratory We are officially in the laboratory for 3 hours per week (2-5pm each Wednesday). The laboratory portion will require computer work. There are assignments due the next week that you will start during the laboratory.

Grade
- Participation and mini-lecture (25%)
- Weekly homework assignment (25%)
- Final exam - theory and conceptual (25%) - ***Due March 18***
- Final exam - practical (pick two concepts)(25%) - ***Papers identified by April 1. Oral presentation due April 29***
  - Population structure: SNP or microsat
  - Ecological genetics: QTL or GWAS
  - Metagenomics: microbial communities or predator diet

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 1*****, 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.

Schedule

Date	Lecture	Reading	Mini-lecture	Lab
14-Jan-15	Intro; History of Mol Ecol	1-3		no lab
21-Jan-15	Genetic toolkit; HWE	4,5		PopGen 1 - diversity
28-Jan-15	Drift, Ne	6,7		PopGen 2 - Ne
4-Feb-15	selection, multiple loci	8,10		PopGen 3 - coal
11-Feb-15	Fst and structure	9		PopGen 4 - Fst
18-Feb-15	Quantitative genetics, QTL	Freeland 5		QTL
25-Feb-15	Gene expression	Freeland 5		Gene expression
4-Mar-15	Spring break			
11-Mar-15	Phylogeography / speciation	16,17		Phylogeography
18-Mar-15	Marine dispersal***	15		Assignment tests
25-Mar-15	Community ecology***	TBD	Marine dispersal	Metagenomics
1-Apr-15	Sex and asex***	TBD	Community ecology	PRACTICAL
8-Apr-15	Forensics and monitoring***	22	Sex and asex	PRACTICAL
15-Apr-15	Exploited populations***	18	Forensics	PRACTICAL
22-Apr-15	Invasive species***	20	Exploited populations	PRACTICAL
29-Apr-15			Invasive species	