Biology 610
Evolutionary Genetics – Ecological Genetics
Fall 2017

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Meeting Times: M/W/F 11:00-11:50
Location: Willamette 112

Course Description: A major goal of evolutionary biology is to understand the processes that generate and maintain patterns of variation in nature. In addition, it is well-known that organisms routinely show a remarkable fit with their environments, suggesting that these phenotypes are adaptive. And adaptation appears to be a major driving force in generating the amazing diversity we see today. So what are the tools that we - as evolutionary biologists - use to study adaptation and speciation in nature? The main goal of this module is to learn how evolutionary biologists experimentally study adaptation and speciation. Such a course is interdisciplinary, in that it unites several areas of biology, including ecology, genetics, statistics, molecular biology, and genomics. By the end of the term, you will have an appreciation for the different techniques and skills that are required to understand the evolutionary process.

Learning outcomes:

- Demonstrate how the evolutionary process is used to understand the processes of adaptation and speciation
- Proficiency in critical thinking based on evaluation of data from primary literature
- Analyze genomic data using statistical and population genetic approaches
- Develop verbal communication skills through in-class discussion and assignments

Readings: Papers from the primary literature will be important for this course, as there are lots of different approaches and techniques used in this field. The best way to get a conceptual handle on this is to read and discuss papers. Some days we will not have time to discuss the papers, but they are available to you for reference. I would recommend reading them regardless of our discussion. Other days, we will spend some time discussing the papers during class time. All papers are available on Canvas as pdfs for download.

Assignments: There will be two assignments during the module that you will need to complete. These involve your analysis of genomic data. I will provide you with instructions on how to

perform the analyses, with some essential background of the problem. My goal is for you to do the analysis, plot the results, and interpret the findings. This is the best way to continue becoming comfortable running analyses in Python and other software packages. Due dates will be determined based on how the course proceeds, but you will have plenty of time to complete them. It is ok to work together on these, but I do expect that your interpretation of the results and the work you provide are your own.

Date	Discussion Topic	Readings
Class 1	Introduction to ecological genetics Connecting genotype-phenotype-fitness	Schemske and Bierzychudek 2007 Barrett and Hoekstra 2011
Class 2	Connect phenotype to fitness: local adaptation	Agren et al. 2013
Class 3	Population Structure: Fst and isolation by distance	Lecsak et al. 2015
Class 4	Population Structure: PCA and Structure/Admixture analyses	none
Class 5	Speciation: reproductive isolation, divergence with gene flow	Coyne and Orr 1989
Class 6	Basic molecular population genetics: selective sweeps and statistics	Martin et al. 2013
Class 7	Genome scans to detect loci important for speciation/adaptation	Turner et al. 2005
Class 8	Run a genome scan	Lowry et al. 2008
Class 9	Genomic islands of speciation? Or something else?	Ellegren et al. 2012
Class 10	Hybrid zones and clines (if we have time)	Burri et al. 2015

Students with Disabilities or who Need Accommodations: I strive to make my classroom an inclusive place for learning for all people. If you have any questions or concerns, please do not hesitate to contact me or see me after class. Please notify me if there are aspects of the instruction or design of this course that result in disability-related barriers to your participation. You are also encouraged to contact the Accessible Education Center in 164 Oregon Hall at 541-346-1155 or *uoaec@uoregon.edu*.