Fish/Ocean 370: Marine Evolutionary Biology Winter 2016

1. Description

Nothing in Biology Makes Sense Except in the Light of Evolution – Dobzhansky 1973

Evolutionary biology is a large discipline, and encompasses investigations in diverse subjects such as morphology, taxonomy, molecular biology, environmental processes and population biology. Evolutionary biologists work in diverse situations, using tools such as genetics and bioinformatics, observational studies of behavior, or fossil and museum collections. In the marine sciences in particular, evolutionary principles have been applied to understanding a wide range of topics. These include global chemical cycles, the origin and progression of life, the impacts of mass extinction events and human-induced change, the conservation and management of marine populations, and medical discovery. Here, we will examine the breadth and current knowledge in the field. We will also provide you with the tools necessary to interpret new developments in this constantly expanding science, and to apply your knowledge to practical situations in marine biology.

2. Objectives

This class aims to develop your skills as a future scientist and provides the basis for an advanced education in the theory and application of evolutionary biology in the marine sciences. The subject matter builds on your previous education in the Introductory Biology series, and is aimed at developing "higher-level" skills and knowledge that will be important to succeed at your senior level classes and beyond.

Specific goals are:

- Develop an advanced understanding relevant to the interpretation of evolutionary processes in marine environments and earth systems as a whole
- Demonstrate the importance and usefulness of evolutionary theory and practice in applications in the marine sciences
- Analyze and interpret different types of data used in evolutionary biology , based on the application of acquired knowledge
- Compile, synthesize and present independent research in a self-selected topic
- Enhance collaborative skills by group participation in class worksheets, laboratory investigations and a final research project

3. Course Instructors

Prof. Kerry Naish, School of Aquatic and Fishery Sciences
Office: Marine Studies Room 209 Email: knaish@uw.edu

Dr José M. Guzmán, School of Aquatic and Fishery Sciences
Office: Fisheries Teaching and Research Room 236 Email: jmguzman@uw.edu

4. Meeting times:

Lectures: M, W, F: 9.30 – 10.20 Room 108
Labs: Fridays 1:30 to 4:20 FTR 124

5. Required Textbook

Zimmer C, Emlen DJ (2015) *Evolution: Making Sense of Life* Roberts and Company, Greenwood Village, Colorado. **Second Edition**

6. Online tools

We have set up a Canvas website that will be used to disseminate resources for the class. To access materials on the website, you will need your UW NetID and password. Lecture materials in Adobe acrobat format will be uploaded to the Lecture Notes page prior to each lecture. A class email list has been established for notifications. *Please check your UW email regularly*, because assignment links will be sent to this email address. (There will be no excuses for emails not read!).

7. Teaching methodology

We are very interested in maximizing your learning and retention of knowledge, and developing your independent research skills. Through several years of research, we have found that you learn best by reviewing the topics prior to the lecture sessions, and applying your knowledge within those sessions. The class is therefore structured as follows:

Lectures: Please complete the assigned readings or online activities before coming to lectures. The sessions will be used to practice the concepts you have read about using discussions, worksheets and hands-on simulations. Your understanding of the exercises will be tested using in-class response systems ("clickers").

Labs: The lab sessions comprise a mixture of instruction and independent research. We introduce analytical approaches relevant to interpreting key concepts in evolution, and ask you to interpret these data. The knowledge gained in these labs will help you independently analyze information relevant to your research project. Many of the labs have a graded assignment that we ask you to submit online.

Research project: In the lab section, you will research a novel question in marine evolution. This research is central to our goal of developing your skills in independent research and synthesis. Therefore, you will develop a paper and a present poster that meets the standards of a presentation at a scientific conference. Rubrics will be provided, and we will use in-lab discussions, online peer review and meetings with instructors to help you craft your research work.

Exams The exams require that you apply your knowledge to novel situations, and so therefore we will use a short-answer format. The exams are not cumulative, but we do expect you to be able to effectively integrate information learned earlier in the class.

8. Coursework and Grades

Grades will be based on the following breakdown:

In-class clicker questions: 10%
Research paper: 15%
Poster: 10%
Labs: 25%
Exams: 40%

We do not mark on a curve, but set the grade based on equal categories between the top grade and the passing grade. This means that your grade is only affected by the top

grade. You do need 50% of the marks to pass this class. Submissions are electronic ONLY. If you don't have access to the internet, or find uploading files difficult, please let us know. ***Policy on late submissions:*** A full 10% will be deducted from a late submission for every day that the work is overdue, starting from the deadline given in class. In other words, if you are given a deadline of 5pm, and you hand in the paper at 6pm, you will lose 10%. This deduction will be waivered under exceptional circumstances. We strongly encourage you to contact us if you are experiencing difficulties prior to the deadline. We are reasonable people….!

9. Academic Conduct

At the University level, passing anyone else's scholarly work (which can include written material, exam answers, graphics or other images, and even ideas) as your own, without proper attribution, is considered academic misconduct. Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120). We expect that you will know and follow university policies on cheating and plagiarism. Any suspected cases of academic misconduct will be handled according to university regulations. For more information, see the College of the Environment's Academic Misconduct Policy and the Community Standards and Student Conduct website.

Our specific policy in the class is to encourage reading of primary literature, and collaboration over data analysis and processing. However, we would like you to present your interpretation of the data independently in the lab sessions. This interpretation includes your own graphics and tables, except where we have asked you to present team-generated work. Instances of plagiarism will result in a zero grade on the relevant assignment or research project.

Instances of cheating during an exam will be awarded a zero on that exam. Entering responses on a clicker other than the one registered to you will result in a zero clicker score up to the day of the event, both for you and for the person whose clicker you use.

10. Disability Accommodations:

It is crucial that all students in this class have access to the full range of learning experiences. At the University of Washington, it is the policy and practice to create inclusive and accessible learning environments consistent with federal and state law. Full participation in this course requires the following types of engagement:

Course component	***Requirements***
Lectures	The ability to attend tri-weekly lectures of 50 minutes with 50 other students. The ability to collaborate in teams; includes worksheets, short discussions of data, the ability to conduct short computer exercises.
Labs	The ability to manipulate lab equipment; includes repetitive motions, use of microscopes and standing for extended periods of time. The ability to spend 3 hours in computer labs to analyze data. The ability to collaborate in teams; includes 10-15 minute data presentations and discussions
Field trip	Physical conditioning and the ability to hike up to one mile on

	beach, estuarine or rocky shore terrain; includes sampling of beach fauna, rocky pools and marshes.
Research project	The ability to collaboratively analyze and interpret data and primary literature; involves computer work, creating text, uploading assignments and presenting a poster.
Exams	The ability to write a set of short-answer questions designed to be completed within 50 minutes in a room with 20 other students.

If you anticipate or experience barriers to your learning or full participation in this course based on a physical, learning, or mental health disability, please immediately contact the instructor to discuss possible accommodation(s). A more complete description of the disability policy of the College of the Environment can be found here. If you have, or think you have, a temporary or permanent disability that impacts your participation in any course, please also contact Disability Resources for Students (DRS) at: 206-543-8924 V / 206-543-8925 TDD / uwdss@uw.edu e-mail / http://www.uw.edu/students/drs.

Roles & Responsibilities

Student: inform the instructor no later than the first week of the quarter of any accommodation(s) you will or may potentially require.

Instructor and TA: maintain strict confidentiality of any student's disability and accommodation(s); help all students meet the learning objectives of this course.

11. Field Trip Insurance

Field trip insurance is strongly recommended for all students registered in any course that includes field trips. Students who do not have regular University of Washington health insurance or adequate personal coverage should consider obtaining a special short-term policy at $.85/day for the course of the field trips. Applications are available here: http://f2.washington.edu/treasury/riskmgmt/ The completed application and payment (made out to the University of Washington) must be made to the Cashier's Office, 129 Schmitz, before the trip.

12. Schedule

Week		Date	Lecture Topic	Readings	Lab session
Wk01	M	4-Jan	Why is evolution important for Marine Biology?		Lab 1 - Adaptation to marine environments
	W	6-Jan	The tools of evolution	Sec 1.1, 3.3	
	F	8-Jan	Geobiology and the history of life I	Sec 3.6, 3.7	
Wk2	M	11-Jan	Geobiology and the history of life II	Sec 3.8, 3.9	Lab 2 - Research Project
	W	13-Jan	Micro and Macro mutations	Sec 5.2, 5.3	
	F	15-Jan	Hardy-Weinberg principles	Sec 6.1 - 6.3	
Wk3	M	18-Jan	***Holiday: Martin Luther King Day***		Lab 3 - Population Genetics
	W	20-Jan	Selection and Adaptation	pp 172 - 182	
	F	22-Jan	Genetic Drift and inbreeding	Sec 6.4, 6.5, 6.7	
Wk4	M	25-Jan	Dispersal and population structure	Sec 6.8	Lab 4 - Research Project
	W	27-Jan	Evolution of fitness traits	Sec 7.1-7.2	
	F	29-Jan	***Exam I: 9.30-10.20 FSH 108***		
Wk5	M	1-Feb	Species and Speciation	Sec 13.1-3, 13.7	Lab 5 - Bioinformatics & Phylogenetics
	W	3-Feb	Tree Thinking: Fundamentals of phylogeny	Sec 4.1-4.3	
	F	5-Feb	Tree thinking: hypothesis testing	Sec 4.4	
Wk6	M	8-Feb	Tree Thinking: molecular phylogenies	Sec 9.1-9.3	Lab 6 - Research Project
	W	10-Feb	Micro and macroevolution	Sec 14.1 - 14.4	
	F	12-Feb	Adaptive Radiations, Mass Extinctions	Sec 14.5-14.9	
Wk7	M	15-Feb	***Holiday: Presidents Day***		Lab 7 - Gene mapping and gene order in Marine Prokaryotes
	W	17-Feb	Diversity of Marine Bacteria and Archaea	No reading	
	F	19-Feb	Primary and Secondary Endosymbiosis	Sec 15.4-15.5	
Wk8	M	22-Feb	Animal Body Plans	Sec 10.5, 10.8	Lab 8 - Comparative evolution - fossils & contemporary relatives
	W	24-Feb	Animal Body Plans		
	F	26-Feb	Sexual selection	Sec 11.2- 11.6	
Wk9	M	29-Feb	Evolution of life histories	Sec 12.1 -12.2	Lab 9 - Sexual selection
	W	2-Mar	Conflict and Cooperation	Sec 15.1-15.3	
	F	4-Mar	Adaption to Different Marine Environments	No reading	
Wk10	M	7-Mar	Adaption to Different Marine Environments	No reading	Lab 10 - poster presentations
	W	9-Mar	Applications: Ocean Change	No reading	
	F	11-Mar	Applications: Conservation and Management	No reading	
Wk 11	W	16-Mar	***Exam 2: 8.30-10.20, FSH 108***		