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
- Enhance collaborative skills by group participation in class worksheets, laboratory investigations and a final research project

3. Course Instructors

Prof. Kerry Naish, Marine Biology and School of Aquatic and Fishery Sciences
Email: knaish@uw.edu
Office hours: Monday, 3.30 – 4.30pm, FSH 208A

Dr José M. Guzmán, Marine Biology and School of Aquatic and Fishery Sciences
Email: jmguzman@uw.edu
Office hours: Thursday: 10:00– 11:00 am, FSH206B

Olivia Cattau, School of Aquatic and Fishery Sciences
Email: ocattau@uw.edu
Office hours: TBD
4. Meeting times

Lectures: M, W, F: 9:30 – 10:20 am, JHN 175  
Labs: Thu & Fri 1:30 to 4:20 pm, FTR 113 and 125

5. Required Textbook

This textbook will be used extensively to help you prepare for each lecture.

6. Online tools and devices

We have set up a Canvas website that will be used to disseminate resources for the class (i.e., learning goals for each session, readings, files, pre-class recordings). To access materials on the website, you will need your UW NetID and password. A class email list has been established for notifications. Please turn on your Canvas notifications and check your UW email regularly. (There will be no excuses for emails not read!). More information on how to use Canvas.

Laptops or computers will be required for this class. If you do not have a personal laptop, you can check out one from the Student Technology Loan Program.

We will use in-class response systems (“clickers”) based on “Poll Everywhere”, which you will sign into using your UW NetID. You can respond using any device. You can download the app directly from the website.

7. Safety

If you feel unsafe or at-risk while taking this or any course, please contact SafeCampus, 206-685-7233 anytime where you can anonymously discuss safety and well-being concerns for yourself or others. SafeCampus can provide individualized support, discuss short- and long-term solutions, and connect you with additional resources when requested. For a broader range of resources and assistance see the Husky Health & Well-Being website.

8. In-class environment during the pandemic

We know that students may have varying levels of comfort about returning to the classroom in this new phase of pandemic learning. Wearing a mask indoors is now optional. We ask that you please respect the decisions of your peers and show compassion and kindness to each other in class. We will continue to wear a mask indoors as that is what makes us most comfortable at this time. However, students should proceed with the choice that is best for them. You can continue to stay updated on Covid trends in our community using the UW dashboard and the King County dashboard.
9. 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:

- **Pre-lecture preparation:** Please complete the assigned readings, videos and online activities before lectures. The readings are outlined in the schedule below – you will be notified of any changes several days ahead the lecture. **Please note:** both readings and videos are supplied for each lecture. The videos are not a substitute for the readings – they provide additional explanations for the materials. You will be able to evaluate your understanding of the material with pre-class quizzes. Pre-class quizzes are due the night before lecture by 11:59 pm (i.e., Su, T, Th 11:59 pm).

- **Lectures:** Sessions will be used to practice the concepts presented in the pre-class readings and videos using in-class assignments (e.g., worksheets, discussions and hands-on simulations). We will use a combination of individual and group work.

- **Summary sheets:** To help develop an integrative approach to learning marine evolutionary biology, you will create a summary sheet that synthesizes and integrates your understanding of the week's material in a pictorial format using flowcharts, diagrams and graphs – rather than text. In addition to implementing deep conceptual learning, this approach allows us to keep track of your learning and misconceptions on a weekly basis. Summary sheets are due every Friday at 11:59 pm, and submissions will be through Canvas. You will also be asked to provide feedback to other students’ summary sheets.

- **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 apply this information to your research project. Some of the labs have a graded assignment that we ask you to submit through Canvas.

- **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 give a presentation that meets the standards at a scientific conference. Rubrics will be provided, and we will use in-lab discussions, 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 final exam places an emphasis on the material in the second part of the quarter, but will draw directly on knowledge gained from the first half.
10. Coursework and Grades

Grades will be based on the following breakdown:

- Pre-class assignment and quizzes: 7.5%
- In-class assignments and quizzes: 7.5%
- Weekly summary sheets: 7.5%
- Research paper drafts: 7.5%
- Research paper final: 20%
- Presentation: 3%
- Labs: 15%
- Exams: 32%

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 final research paper grade, 50% of the exam grade, and 50% of the marks overall to pass this class.

Drop Policy: We will drop – i.e., it will not be considered for your overall score in this class:

- The lowest grade of your summary sheets
- The three lowest grades of your pre-class quizzes
- The three lowest grades of your Poll Everywhere quizzes

Note: The drop policy does not include exams or labs.

11. Attendance and Participation Policies

We have designed this course to maximize your learning of the subject matter and advance your skills through a variety of activities. Therefore, our attendance policy is aimed at supporting our educational goals.

- Assignments designed to help you prepare for class (e.g. online quizzes, discussions or homework due in class or section) will not be accepted after the due time.
- Work scheduled to be presented or performed in class (e.g., in class worksheets, discussions and hands-on simulations) and in-class quizzes (Poll Everywhere) will not be accepted after the due time.
- Lab assignments and summary sheets that are submitted late will incur a 15% deduction 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 5:00 pm, and you hand in the assignment at 5:01 pm, you will lose 15%.
- Exam Attendance. Exams are only offered on the scheduled dates and time, and “make up” exams will not be offered.

**Excused absences:** Our attendance and participation policies are flexible only under specific circumstances. Excused absences are religious holidays, pre-approved professional activities, injury or illness of student or immediate family member. Verification of these events will be needed. We strongly encourage you to give us notification of anticipated absences as early as possible.

*If you foresee any issue with the schedule, come and talk to us! We are very reasonable people.*
12. 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:

<table>
<thead>
<tr>
<th>Course component</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>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.</td>
</tr>
<tr>
<td>Labs</td>
<td>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</td>
</tr>
<tr>
<td>Research project</td>
<td>The ability to collaboratively analyze and interpret data and primary literature; involves computer work, creating text, uploading assignments and presenting a final paper and video.</td>
</tr>
<tr>
<td>Exams</td>
<td>The ability to write a set of short-answer questions designed to be completed within 50 or 90 minutes.</td>
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</tbody>
</table>

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: please inform the instructor no later than the first week of the quarter of any accommodation(s) you will or may potentially require.
Instructors: we will maintain strict confidentiality of any student’s disability and accommodation(s) and help all students meet the learning objectives of this course.

13. Religious accommodations

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy. Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request Form. The request period is March 19-April 08 2022.
14. Inclusivity and classroom climate
In an ideal world, science would be objective. However, our experiences and backgrounds mean that scientific thought and the interpretation of science can be subjective. We would like to create a learning environment that supports a diversity of thoughts, perspectives and experiences, and honors everyone’s backgrounds and identities. To help accomplish this goal, we will attempt to foster a culture in which each class member is able to respect and hear each other. We ask that everyone be considerate of other’s views and mindful of your own.

There are uncomfortable situations that may arise in class, and sometimes these occur despite the intentions of your colleagues or your instructors. There are several steps we can work towards alleviating some of this discomfort. Please come and discuss the situation with us or, if you prefer, we will be happy to direct you to resources within our School or University. We also encourage you seek out alternative avenues to address these situations, if these settings are more comfortable to you.

15. Academic Conduct

The University of Washington Student Conduct Code (WAC 478-121) defines prohibited academic and behavioral conduct and describes how the University holds students accountable. We expect that you will know and follow university policies regarding all forms of academic and other misconduct.

Acts of academic misconduct include:

- Cheating:
  - unauthorized assistance in person and/or online for assignments, quizzes, tests or exams
  - using another student's work without permission and instructor authorization
  - allowing anyone to take a course, assignment or exam for you without instructor authorization
- Falsification: intentional use of falsified data, information or records
- Plagiarism: representing the work of others as your own without giving appropriate credit to the original author(s)
- Unauthorized collaboration: working with other students in the course on assignments, quizzes or exams without permission
- Engaging in behavior prohibited by an instructor
- Multiple submissions of the same work in different courses without instructor permission
- Deliberately damaging or destroying student work to gain advantage
- Unauthorized recording, and/or subsequent dissemination of instructional content

If these definitions are not clear to you, please contact us so that we can review them with you. It is important that you fully understand what is and is not permissible in this course.

Any suspected cases of academic misconduct will be handled according to university regulations, which include:

- submission of the case material (description of the incident and supporting documents such as an exam, paper, and any communications about the incident) to the College of the Environment Dean’s Office
- suspension of the grade for the quiz, exam, homework, paper or other assignment in question
- an X grade for the class in the case of the academic misconduct procedure continuing past the end of the quarter
- a reduction, down to a zero, for the quiz, exam, homework, paper or other assignment in question

should the academic misconduct hearing officer find you responsible

For more information, see the College of the Environment’s Academic Misconduct Policy and the Community Standards and Student Conduct website.
15. Academic Conduct (Continued)

**Our specific policies on collaboration, copying and plagiarism**

- **In Labs**, we encourage you to read and discuss primary literature, and collaborate over data analysis and processing. However, we would like you to present your interpretation of the data independently in the lab sessions and research paper. This interpretation includes your own graphics and tables, except where we have asked you to present team-generated work. All writing should be your own. Instances of copying and plagiarism will result in a zero grade on the relevant assignment or research project.

- **Exams** must be taken independently, and no collaboration is permitted in any form, including in person and online collaboration. Instances of cheating during an exam will be awarded a zero on the entire exam.

- **In pre-class assignments**, we encourage collaboration and discussion, but ask you to respond on your own.

- **In in-class assignments**, we encourage collaboration and discussion in most cases, and may ask you to respond to questions alone or as a group. All writing and data analyses associated with in-class assignments should be your own.

**Our specific policy on sharing of course materials**

Do not share any course materials (lectures, lecture notes, recordings, assignments, quizzes, exams) posted to the class Canvas site. These materials are protected by U.S. copyright law and by University policy and may not be reproduced, distributed, displayed, posted or uploaded without written permission from the instructor. If you do so, you may be subject to academic misconduct proceedings under the [UW Student Conduct Code](#).

16. Student Academic Grievance Procedures

The College of the Environment [Student Academic Grievance Procedures](#) provide mechanisms for enrolled students to address academic problems or grievances in an equitable, respectful and timely manner. Academic grievances are defined as those involving conflicts between a student or students and their course instructors (including faculty and teaching assistants) or research mentor(s) with respect to differences arising within credit-bearing work and while the student is registered at the University of Washington. If you have or are experiencing such a conflict in this class, and have not, cannot, or do not wish to attempt resolution with me, I encourage you to explore additional options open to you by accessing the website above.
## 17. Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture Topic</th>
<th>Readings</th>
<th>Thu/Fri Lab session</th>
</tr>
</thead>
<tbody>
<tr>
<td>28-Mar</td>
<td>Why is evolution important for Marine Biology?</td>
<td></td>
<td>Wk1 - Intro to research project, writing papers</td>
</tr>
<tr>
<td>30-Mar</td>
<td>Tools and Concepts in Evolutionary Biology</td>
<td>Sec 1.1, 3.2, 3.3</td>
<td></td>
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<tr>
<td>1-Apr</td>
<td>Tree Thinking: Fundamentals of phylogeny</td>
<td>Sec 4.1-4.3</td>
<td></td>
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<tr>
<td>6-Apr</td>
<td>Sources of Genetic Variation</td>
<td>Sec 5.1, 5.4, 5.5</td>
<td>Wk2 - Bioinformatics &amp; Phylogenetics</td>
</tr>
<tr>
<td>8-Apr</td>
<td>Tree Thinking: molecular phylogenies</td>
<td>Sec 8.1-2, 8.4, Box 8.3</td>
<td></td>
</tr>
<tr>
<td>4-Apr</td>
<td>Tree thinking: hypothesis testing</td>
<td>Sec 4.4-5, Box 4.3</td>
<td></td>
</tr>
<tr>
<td>11-Apr</td>
<td>Population genetics: Hardy-Weinberg</td>
<td>Sec 6.1 - 6.3</td>
<td>Wk3 - Population Genetics I</td>
</tr>
<tr>
<td>13-Apr</td>
<td>Population genetics: Selection and Adaptation</td>
<td>pp192-193, 196-203</td>
<td></td>
</tr>
<tr>
<td>15-Apr</td>
<td>Population genetics: Genetic Drift, inbreeding, migration</td>
<td>Sec 6.4, 6.5, 6.8</td>
<td></td>
</tr>
<tr>
<td>18-Apr</td>
<td>Population genetics: Evolution of fitness traits</td>
<td>Sec 7.1-7.2</td>
<td>Wk4 - Population Genetics II</td>
</tr>
<tr>
<td>20-Apr</td>
<td>Population genetics: Applying concepts I</td>
<td>Sec 6.9</td>
<td></td>
</tr>
<tr>
<td>22-Apr</td>
<td>Population genetics: Applying concepts II</td>
<td>Online materials</td>
<td></td>
</tr>
<tr>
<td>25-Apr</td>
<td><strong>Exam I: 9.30-10.20</strong></td>
<td></td>
<td>Wk5 - Research Project</td>
</tr>
<tr>
<td>27-Apr</td>
<td>Evolutionary Ecology: Sexual selection I</td>
<td>Sec 11.1 - 11.3</td>
<td></td>
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<tr>
<td>29-Apr</td>
<td>Evolutionary Ecology: Sexual selection II</td>
<td>Sec 11.4 - 11.6</td>
<td></td>
</tr>
<tr>
<td>2-May</td>
<td>Evolutionary Ecology: Evolution of life histories I</td>
<td>Sec 12 (intro), 12.1 -12.3</td>
<td>Wk6 - Speciation through natural selection</td>
</tr>
<tr>
<td>4-May</td>
<td>Evolutionary Ecology: Life histories and Behavioral Ecology</td>
<td>Sec 12.3, 16.6-16.8</td>
<td></td>
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<tr>
<td>6-May</td>
<td>Species and Speciation I</td>
<td>Sec 13.1, 13.7, 13.2</td>
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<tr>
<td>9-May</td>
<td>Species and Speciation II</td>
<td>Sec 13.3, 13.4</td>
<td>Wk7 - Research Project</td>
</tr>
<tr>
<td>11-May</td>
<td>Evolutionary Ecology: Coevolution</td>
<td>Sec 15.1-15.2</td>
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<tr>
<td>13-May</td>
<td>Macroevolution: Biogeography I</td>
<td>Sec 14.1 - 14.4</td>
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<tr>
<td>16-May</td>
<td>Macroevolution: Biogeography II</td>
<td>Sec 14.6-14.10</td>
<td>Wk8 - Research Project</td>
</tr>
<tr>
<td>18-May</td>
<td>Geobiology and the history of life I</td>
<td>Sec 3.6-3.10</td>
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<tr>
<td>20-May</td>
<td>Geobiology and the history of life II</td>
<td>Online materials</td>
<td></td>
</tr>
<tr>
<td>23-May</td>
<td>Key events: Evolution of Marine Prokaryotes</td>
<td>Online materials</td>
<td>Wk9 - Final submission</td>
</tr>
<tr>
<td>25-May</td>
<td>Key events: Evolution of Eukaryotes, Endosymbiosis</td>
<td>Online materials, p578-579</td>
<td></td>
</tr>
<tr>
<td>27-May</td>
<td>Key events: Applying concepts</td>
<td>Online materials</td>
<td></td>
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<tr>
<td>30-May</td>
<td><strong>Holiday: Memorial Day</strong></td>
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<tr>
<td>1-Jun</td>
<td>Revision Workshop I</td>
<td></td>
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<tr>
<td>3-Jun</td>
<td>Revision Workshop II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-Jun</td>
<td><strong>Exam 2: 8.30-10.20</strong></td>
<td></td>
<td>Wk10 - Presentations</td>
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</tbody>
</table>