

**Biology 25: Marine Biology**

**Spring 2019  
General Information**

**Professor:** Celia Y. Chen, Rm. 126 Class of '78 Life Sciences Center, HB 6044  
[Celia.Chen@dartmouth.edu](mailto:Celia.Chen@dartmouth.edu)

**Graduate Teaching Assistant:** Clare Doherty, 1<sup>st</sup> floor lab, LSC  
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**Schedule:** Lecture MWF 11:30-12:35 (11-period)  
X-period, Tuesday 12:15-1:05

**Location:** Lectures and X-hours, 105 Life Sciences Center  
(unless otherwise announced)

**Office hours:** C. Chen: M 2:30-3:30, W 2:30-3:30 (also by appointment which is encouraged!)  
C. Doherty: ????? (also by appointment)

**Course purpose:**

The overall objective of the course is to explore the amazing range of ecosystems in the world's oceans and coastal areas, and to examine how abiotic (physical, chemical) and biotic factors (interactions with other living organisms) shape the ecological characteristics of organisms in these marine systems. We will also learn about the role of human interactions with these ecosystems and discuss some of the complexities of the current science/policy issues.

**Required Books:**

**Textbook:** Levinton, 2017, *Marine Biology* (paperback), Oxford University Press, 5th Revised International Edition. Reading assignments will be noted on each lecture outline. The pages listed in the attached syllabus below are only *tentative* assignments for the textbook (Levinton) and do not include additional scientific papers and reports which will be assigned and handed out with each lecture.

**X-period:** X-Hours will be used for discussions of scientific papers and films.

**Films:** Films will be made available online so that you can view them at your leisure. For some topics, online video will also be assigned. Content of films and videos will be covered in exams.

**Class Discussions:** Class discussions will be held in a "jigsaw activity" format that will involve student "expert groups" that will focus on student becoming experts on individual papers (in the 1<sup>st</sup> discussion session). Members of those groups will present the content of their papers to other students in "mixed groups" and students will learn about a group of papers from their fellow students (in the 2<sup>nd</sup> discussion session). This format will facilitate small group learning and allow you to participate in informing your fellow students.

**Taxonomy Lab:** You will have one class period in the laboratory dissecting preserved samples of marine invertebrates and vertebrates. In this laboratory activity, you will learn the relationship of the anatomical features of each organism to their ecological function.

**Hourly Exams:** 2 hourly exams and a final exam (1<sup>st</sup>: 20%, 2<sup>nd</sup>: 25%, 3<sup>rd</sup>: 30%). For each exam, 90% of the content will be from lectures and required readings, 10% from films and discussions. Exam format (10-15 short essays).

**Field Trip:** Location Marine Biological Laboratory (MBL), Woods Hole MA, and Waquoit National Estuarine Research Reserve, Falmouth MA. Saturday to Sunday, May 11-12<sup>th</sup> (6AM on 11<sup>th</sup>) to (5PM on 12<sup>th</sup>). The field trip will have three components: 1) going out on the research vessel, the *Gemma*, to sample for marine organisms; 2) visiting the Marine Resources Center (at MBL) where marine organisms are cultured for ecological and biomedical research; 3) visiting the field study sites of the Waquoit National Estuarine Research Reserve at a nearby beach and on a local salt marsh. This trip is not required but those who cannot participate will have a separate assignment.

**Writing Assignment:**

There will be a writing assignment involving research on a marine biology research topic of your choice. The assignment will involve investigating primary scientific literature on a topic of interest to you and developing a set of testable questions based on and supported by the current state of the research. The investigation will culminate in a short paper written in the style of a scientific proposal. The assignment will be due in the middle of the term and comprise 15% of the final grade.

**Required Reading:**

*American Catch, Paul Greenberg 2014*

This book will be the focus of a class discussion and a starting point for talking about the interaction between fisheries and marine ecosystems in the second half of the course. The book is about the history and current state of three different fisheries that were in the past sourced from coastal waters of the US but now are largely imported. The author discusses the links between our coastal waters and the ability of those waters to support fisheries that could provide seafood protein to the US. However, like many fisheries, the sources and customers are global as are impacts on the coastal environments on which they depend. We will have a class discussion on the science and the policy issues concerning these and other fisheries.

**Group Presentations:** There will be student group presentations on the scientific and policy issues surrounding three different fisheries. In each topic area, groups of students will represent industry, environmental advocates, or government regulators. Groups will turn in a summary of the major points of their presentation that will comprise 5% of the final grade. All of you will be responsible for material presented by all of the groups.

### ***GENERAL COURSE ISSUES***

***Special Accommodations:*** “Students requiring disability-related accommodations must register with the Student Accessibility Service office. Once SAS has authorized accommodations, students must show the originally signed SAS Accommodations/Consent Form and/or a letter on SAS letterhead to their professor. As a first step, if students have questions about whether they qualify to receive accommodations, they should contact the SAS office. All inquiries and discussions about accommodations will remain confidential.”

***Religious Observances:*** Students may wish to take part in religious observances that fall during this academic term. Should you have a religious observance that conflicts with your participation in the course, please come speak with me before the end of the second week of the term to discuss appropriate accommodations.

***Athletic Obligations:*** While it is important for you to meet your commitments to your athletic teams, it is also your responsibility to meet your academic ones. When missing class for athletic events, it is highly recommended that you meet with me or the TA, Claire Weaver, to make up material covered in the lecture.

***Honor Code:*** As with all courses, you are expected to follow the guidelines of *Sources, Their Use and Acknowledgment* that can be found on the internet at <http://writing-speech.dartmouth.edu/learning/materials/sources-and-citations-dartmouth>. The sections most relevant to this course are in the section, “What is plagiarism?” Citation formats for papers and projects will be discussed in class.

***Technology Use:*** While use of laptops is permitted in class, surfing the web is not. I strongly encourage you to refrain from engaging with technology in class unless it is related to course content. Web surfing and cell phone use is distracting to your classmates.

### Lecture Schedule

<u>Date</u>	<u>Topic</u>	<u>Assignment</u>
M 25 Mar	Introduction to Marine Systems	pp. 1-11, 46-73 <i>Paul Snelgrove</i> <i>TED talk</i>
Tu 26 Mar	<i>"Journey to the Ocean Floor"</i>	
W 27 Mar	The World Oceans: Geologic and Physical Environment	pp. 12-28
<b>Coastal Margins</b>		
F 29 Mar	Estuaries – where freshwater meets saltwater	pp. 28-32, 352-364 <i>"Poisoned Waters"</i> (Ches. Bay)
M 1 Apr	Rocky Intertidal – Habitat, Zonation, and Ecology	pp. 317-340, 260-266 <i>"Blue planet: Tidal Seas"</i>
Tu 2 Apr	Class discussion: Expert groups discuss their papers	<i>Papers to be assigned</i>
W 3 Apr	Soft Sediment Environs - Life habits and interactions	pp. 297-316, 334-338
F 5 Apr	Salt Marsh Ecosystems	pp. 341-349
<b>The Pelagic Zone</b>		
M 8 Apr	Phytoplankton and Primary Productivity	pp. 145-149, 189-192, 211-234
Tu 9 Apr	Class discussion: Mixed groups share papers	
W 10 Apr	<i>Marine invertebrate Lab dissection</i> (LSC 106)	pp. 268-296
F 12 Apr	Presentation of Dissections Paper Assignment Discussion	
M 15 Apr	<b>Hour Exam I</b>	
Tu 16 Apr	Class discussion: Expert groups discuss their papers	Papers TBA
W 17 Apr	Zooplankton Communities (Expert group paper outline due)	pp. 149-158, 234-238
F 19 Apr	Planktonic Food Webs and the Microbial Loop	pp. 219-220
M 22 Apr	Nekton: Composition, Morphology, Populations	pp. 159-171 <i>"Ocean Drifters"</i>
Tu 23 Apr	Class discussion: Mixed groups share papers	
W 24 Apr	Marine Mammals: Organisms and Adaptations	pp. 171-179, 492-494 <i>Film: "Science of Whales"</i>
F 26 Apr	Marine Mammal Acoustics	<i>Reading TBA</i> <i>Peter Tyack TED talk</i>

- M 29 Apr Discussion of “*American Catch*”  
Tu 30 Apr *Fisheries Group Meeting*  
(*Writing assignment due*)  
TOPIC???  
(Clare Doherty, EEES Graduate Program)

### Deep Sea Environments

- F 3 May Deep Sea Community Ecology: pp. 201-210, 414-433  
  
M 6 May Hydro Thermal Vents (Kate Buckman, *“The Blue Planet: The Deep”*  
Ph.D., Dept. of Biological Sciences) Papers TBA  
Tu 7 May Class discussion: Expert groups discuss papers  
W 8 May **Hour Exam II**

### Tropical Marine Environments

- F 10 May Coral Reefs: Environment and Community Interactions pp. 382-399  
*Film: “Blue Planet: Coral Seas”*  
  
S 11-12 Field trip to Woods Hole MA (Sat.-Sun.)  
May  
  
M 13 May Coral Reef Disturbance pp. 399-404  
Tu 14 May Class discussion: Mixed groups share papers

### Human Impacts on Marine Systems

- W 15 May Tale of Two Oil Spills: Exxon and BP pp. 514-521  
*“After the Spill”*  
F 17 May Fisheries Models and Management pp. 471-492  
*“Empty Oceans Empty Nets”*  
  
M 20 May Harmful algal blooms pp. 521-526  
Tu 21 May Climate Change: Acidification and warming pp. 33-45, 250-254,  
497-499, 526-529, 404-407  
  
W 22 May Mercury Pollution in the Marine Environment pp. 509-511  
F 24 May *Group Presentation*  
  
M 27 May *Group Presentation*  
Tu 28 May *Group Presentation*  
W 29 May *Group Presentation*

**FINAL EXAM** – Date and time to be announced