Course Syllabus and Schedule

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Prerequisites: None

Credit hours: 3

Course Objectives/Goals:
This course introduces major concepts of ecology using examples from marine ecosystems. Knowledge of relationships between organisms and their environments is critical to understand the intricacies of the natural world and solve environmental problems that confront us today. You will gain an understanding of:

1. Major principles underlying the ways organisms interact with their physical and biological environments;
2. How complex ecological systems function;
3. Approaches and tools employed in ecological research;
4. Application of ecological concepts to solving environmental problems and conserving biodiversity

We use a combination of lectures, discussions, field and laboratory exercises, and projects. Field and laboratory sessions develop topics covered in lecture, explore some topics in depth, and hone your skills in reading and critically evaluating scientific literature. We will focus on the intertidal of Appledore Island, which offers many opportunities to closely study ecological principles and processes. To do this, you also will need to learn about organismal diversity in the intertidal. Your field and laboratory work will yield three projects: 1) A Simple Electronic Field Guide to Intertidal Organisms of Appledore Island; 2) Demographic Studies of Barnacle Distribution in the Intertidal; and 3) Intertidal Ecology. We will explain more about these in class.

Course Materials:
We will make few explicit reading assignments, but you can freely consult the reference books listed on page 1. Copies are in the Laighton Library or Palmer-Kinne (“P-K”) Laboratory.
Assignments & Grading:
Quizzes in lectures will introduce you to our examination style. One midterm exam and practical will be given. The final exam and practical will be cumulative. All material presented in the course will be included on exams.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Midterm Exam and Practical</td>
<td>250 pts</td>
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<tr>
<td>Final Exam and Practical</td>
<td>250 pts</td>
<td>25%</td>
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<tr>
<td>Class Participation</td>
<td>50 pts</td>
<td>5%</td>
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<tr>
<td>Quizzes</td>
<td>50 pts</td>
<td>5%</td>
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<tr>
<td>Field and Laboratory Projects</td>
<td>400 pts</td>
<td>40%</td>
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Expectations and Conduct:
Students are responsible for fully understanding all of the information presented in this syllabus. If there are any questions regarding this information, it is the student’s responsibility to bring it to the instructor’s attention. In addition, students are responsible for attending all activities associated with this course and completing all assignments. Students are responsible for asking questions anytime they need clarification (remember, there is no such thing as a bad question).

Every student is responsible for their own behavior- specifically in being respectful and collegial to other students and with instructors. Students are responsible for fully understanding and adhering all of the information presented in the SML Appledore Handbook (http://www.sml.cornell.edu/sml_forms.html)

1. *Personal Technology*. Do not use cell phones, smart phones, iPads, mp3 players, headphones, or similar devices in the classroom or during course activities. If you take notes with your computer, disable wireless access during lecture.

2. The lab has a modest computer facility in Laighton Library; please treat this shared facility with respect. Printers are available, but please limit printing to your FINAL document (if required).

3. *Transmission of Course Materials*. Students are not authorized to replicate, reproduce, copy or transmit lectures and course materials presented, or derivative materials including class notes, for sale or free distribution to others without written consent of the instructors who are the original source of the materials. Lectures and other class sessions may not be recorded (neither video nor audio) without written consent of the instructors.

4. *Academic Integrity*. Any work submitted must be your own. Uncredited use of another person’s words, data or images is considered plagiarism, a serious violation of the Code, whether the material comes from another student, a web site, or a published paper. Students must adhere to Cornell’s and UNH’s Policy for Academic Honesty/Plagiarism and Discrimination
   i. Cornell: http://cuinfo.cornell.edu/aic.cfm
   ii. UNH: http://www.unh.edu/vpsas/handbook/welcome-university-new-hampshire

5. *Disabilities & ADA Accommodation*. Students with a disability must contact Cornell’s (420 CCC building; 607-254-4545) or UNH’s Student Disability Services (http://www.unh.edu/disabilityservices) four weeks prior to start of class for confidential discussion of needs and for registration to verify eligibility for academic accommodations. No retroactive accommodations can be made.

6. *Mental Health*. Shoals Marine Laboratory cares about you and your well-being. If you experience unusual personal or academic stress during the course or need to talk with someone about a personal problem, seek support from your instructors as soon as possible. In addition, any SML staff is available for consultation 24/7. Find staff in the office in the Hamilton House between 8am – 7pm or knock on the door of Bartels House after hours.
Tentative Schedule:

Mon July 20

Introduction (Low tide: 8:57 PM, +1.0ft)
1:00 Depart Portsmouth
2:00-3:00 Arrive on Appledore Island; Fire and Water; Room assignments
3:30-4:00 General introduction to course (discussion; all faculty)
4:00-4:45 Geographical and physical environment (lecture; JF)
5:00-5:45 Marine Environments and Organisms: Vertebrates (lecture; JMC)
6:00-6:30 Dinner
7:00-8:15 Marine Environments and Organisms: Marine Invertebrates I (lecture; JF)

Tue July 21

Marine Environments and Organisms (Low tide: 9:20 AM, +0.6ft)
7:30-8:15 Breakfast
8:15-10:45 Intertidal Zonation I: Introduction to the intertidal environments of Appledore Island: Protected side (field/lab; JF & RZ)
10:45-11:15 Sea table time and identification of organisms
11:15-12:30 Marine Environments and Organisms: Seaweeds I (lecture; RZ)
12:30-1:00 Lunch
1:00-1:15 Class photo
1:15-2:15 Physics of global climate (lecture; JMC)
2:30-3:30 Isotopes and ecology (lecture; JMC)
3:45-5:15 Using stable isotopes to investigate diet (lab; JMC)
5:15-5:45 Introduction to Project I: Assignment of species for a Simple Electronic Field Guide to Intertidal Organisms of Appledore Island (TA; due 6:00 pm July 23)
6:00-6:30 Dinner
7:00-9:30 Island cruise (weather depending) or Questioning Authority (discussion; JMC) Island-wide “Rock Talk” with Dr. Jeb Byers

Wed July 22

Populations (Low tide: 10:00 AM, +0.8ft)
7:30-8:15 Breakfast
8:15-8:30 QUIZ I
9:00-11:15 Intertidal Zonation II: Intertidal environments of Appledore Island: Exposed side (field/lab; JF & RZ)
11:15-12:30 Sea table time and identification of organisms
12:30-1:00 Lunch
1:15-2:30 Marine Environments and Organisms: Marine Invertebrates II (lecture; JF)
2:45-4:00 Marine Environments and Organisms: Seaweeds II (lecture; RZ)
4:15-4:45 FOOD RUN
4:45-5:45 Population distribution and abundance (lecture; JMC)
6:00-6:30 Dinner
7:00-9:30 Island cruise (weather depending) or Questioning Authority (discussion; JMC)
After Cruise Introduction to Project II: Barnacle demographic study (TA; due 7:30 AM July 25)

Thu July 23

Species Interactions (Low tide: 10:43 AM, +1.0ft)
7:30-8:15 Breakfast
8:15-9:15 Demography and life tables (lecture; JMC)
9:30-10:45 Barnacle demographic study II: Data collection (field; TA)

project deadline
11:00-12:15 Marine Environments and Organisms: Marine Invertebrates III
(lecture; JF)
12:30-1:00 Lunch
1:15-2:15 Hagfish: Can you manage a population when key data are missing?
(lecture; JMC)
3:00-6:00 Hagfish pick-up (field trip; JMC)
6:00-6:30 PROJECT I DUE: A Simple Electronic Field Guide to Intertidal Organisms of Appledore @ 6pm; Dinner follows
7:00-8:00 Island cruise (weather depending) or Questioning Authority
(discussion; JMC) Island-wide “Rock” talk
8:00-10:00 Work on Projects

Fri July 24 Communities, continued (Low tide: 11:28AM, +1.2ft)
7:30-8:15 Breakfast
8:15-9:45 Mutualism and commensalism (lecture; JMC)
10:00-11:30 Marine Environments and Organisms: Marine Invertebrates III
(lecture; JF)
11:30-12:30 Community Structure: Physical environment and influence of abiotic factors on community structure (lecture; RZ & JF)
12:30-1:00 Lunch
1:00-2:30 Barnacle demographic study III: Analysis (lab; TA)
2:45-4:30 Fish dissections (lab; TA)
4:45-5:45 Reproduction and life history strategies of intertidal algae (lecture; lab; RZ)
6:00-6:30 Dinner
7:00-9:00 Project/Study Time

Sat July 25 Communities, continued (Low tide: 12:18PM, +1.4ft)
7:30-8:15 PROJECT II DUE: Barnacle demographic study @ 7:30am; Breakfast follows
8:30-12:30 Introduction to Project III: Intertidal ecology study (lecture and field; JF & RZ; data due July 31, reports and presentations due Aug. 2)
12:30-1:00 Lunch
1:00-3:00 Intertidal Ecology Project (low tide: 12:18PM)
3:00-5:00 Invertebrate dissections (lab; JF)
5:00-6:00 Study time
6:00-6:30 Dinner
7:00-8:00 Q&A review session. (Students come prepared with questions.)
8:00-10:00 Project/Study Time

Sun July 26 Ecosystem and Global Ecology (Low tide: 1:10PM, +1.4ft)
9:00-10:00 Dormitory clean up
10:00-11:00 Brunch
11:00-2:00 Study time
2:15-5:00 EXAM AND PRACTICAL I
5:00-5:30 Dinner
5:30-7:00 Intertidal Ecology Project
7:00-8:30 Movie

Mon July 27 Ecosystem and Global Ecology, continued (Low tide: 2:04PM, +1.3ft)
7:30-8:15 Breakfast
8:15-10:30 Food webs, keystone species, and trophic cascades (lecture; JMC)
11:00  Depart Appledore for Creek Farm
12:00  Lunch at Creek Farm
12:45-3:00 Mud flat collecting (low tide: 2:04PM)
3:00-56:00 Explore Portsmouth
56:00  Depart from Portsmouth
6:30-7:00 Late dinner on Appledore

Tue July 28  Ecosystem and Global Ecology, continued (Low tide: 2:57PM, +1.0ft)
7:30-8:15 Breakfast
8:15-9:15 Production, decomposition, and energy flow (lecture; JMC)
9:30-10:30 Signals for Survival (movie; HW)
10:30-11:30 Behavior at Four Levels of Ecology (lecture; HW – Cassie Stoddard?)
12:30-1:00 Lunch
1:00-2:00 Nutrient cycling (lecture; JMC)
2:00-5:00 Intertidal Ecology Project (low tide: 2:57PM)
5:00-6:00 Seal watch (field trip; JMC)
6:00-6:30 Dinner
7:00-8:00 Introduction to Whale Watch (lecture; HW) Island-wide “Rock Talk” with Dr. Larry Mayer

Wed July 29  Topics in Ecology (Low tide: 3:42AM, +0.2ft; 3:49PM, +0.6ft)
7:30-8:15 Breakfast
8:30-9:30 Whale Watch Prep lecture (Alexa)
8:30-10:00 Whale Watch (R/V Gulf Challenger) – Lunch on boat
4:30-2:00-4:006:00 Intertidal Ecology Project (low tide: 3:49PM)
4:15-4:45 FOOD RUN
5:00-6:00 Intertidal Ecology Project (low tide: 3:49PM)
6:00 Dinner
7:00-8:00 Ecology of the global carbon cycle (lecture; JMC)
8:00-10:00 Project/Study Time

Thu July 30  Topics in Ecology, continued (Low tide: 4:32AM, -0.3ft; 4:39PM, +0.2ft)
7:30-8:15 Breakfast
8:30-9:30 Study time
9:30-9:45 QUIZ II
9:45-10:45 Ecological response to global environmental change (lecture; JMC)
11:00-12:15 Isotope data analyses
12:30-1:00 Lunch
1:15-4:156:00 Intertidal Ecology Project (low tide: 4:39PM)
4:15-4:45 FOOD RUN
5:00-6:00 Intertidal Ecology Project (low tide: 4:39PM)
6:00-6:30 Dinner
7:00-8:00 All-island “Rock Talk”
8:15-10:00 Project/Study Time

Fri July 31  Topics in Ecology, continued (Low tide: 5:20AM, -0.8ft; 5:30PM, -0.2ft)
data deadline
Early morning  As needed, Intertidal Ecology Project (low tide: 5:20AM)
7:30-8:15 Breakfast
8:15-12:30 Intertidal Ecology Project
12:30 Intertidal Ecology Data Due [TA will organize data and distribute all data to all groups]
12:30-1:00 Lunch
1:00-2:00 Q&A review session. (Students come prepared with questions.)
2:00-6:00 Project/Study Time
6:00-6:30 Dinner
7:00-9:00 Project/Study Time

Sat August 1

**Final Exam and IEP (Low tide: 6:07AM, -1.1ft; 6:20PM, -0.5ft)**
 Early morning As needed, Intertidal Ecology Project (low tide: 6:07AM)
7:30-8:15 Breakfast
8:30-11:30 FINAL EXAM AND PRACTICAL
11:30-12:30 Rest
12:30-1:00 Lunch
1:00-6:00 Intertidal Ecology Project
6:00-6:30 Dinner
7:00-9:00 Intertidal Ecology Project

Sun August 2

**Final Project Reports (Low tide: 6:55AM, -1.3; 7:12PM, -0.7ft)**
9:00-10:00 Dormitory clean up
10:00-11:00 Brunch
11:00-2:00 PROJECT III REPORT: Intertidal Ecology Project, Presentations
2:00-4:45 Optional Fishing trip
4:00-5:00 Online Course Evaluations (2 surveys for SML, mandatory)
5:00-6:00 Dinner

Mon August 3

**Students Depart for Mainland**
7:30-8:00 Breakfast (luggage on porch before breakfast)
9:00 Meet at dock for departure
4:009:15 Depart Appledore
10:30 Return to Portsmouth
BioSM 1610: 10 Core Concepts or Student Learning Goals

1. Where and why different biomes occur globally as a function of Earth’s climate dynamics.
2. How plants and animals cope with environmental variation through a range of adaptations that modify their respective heat and water balances.
3. Processes of autotrophic and heterotrophic means of energy acquisition, and tradeoffs among these strategies.
4. Fundamental principles of population growth and demography, including application to human populations and population harvest.
5. Introduction to species interactions including predation, parasitism, competition, and mutualism.
6. Overview of community ecology, including factors that control patterns of species distribution, diversity, and abundance.
7. Basic understanding of broad biogeographical patterns of species distributions, including hypotheses explaining latitudinal species gradients, species diversity on islands, and the application of island biogeography theory to the design of nature reserves.
8. Threats to biodiversity and key principles of conservation biology.
9. Major pathways and mechanisms of nutrient cycling, including nutrient inputs, acquisition strategies, limitation, and losses, and major human impact on these cycles.
10. Causes, general magnitudes, and likely consequences of human-driven alterations to global cycles of carbon, nutrients, and climate.