



Appledore Island, Isle of Shoals, Kittery, Maine
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Shoals Marine Laboratory
Ecology and the Marine Environment (BIOSM 1610/MEFB 674)
July 29 – August 12, 2019

Course Syllabus and Schedule

Faculty: Dr. Jan Factor (jan.factor@purchase.edu)
Dr. Jed Sparks (jps66@cornell.edu)
Dr. Rick Zechman (rick.zechman@humboldt.edu)

TA: Jasmin Buteau (jasmin.buteau@gmail.com)

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 two projects: 1) A study of the ecology of tide pools and 2) Intertidal Ecology. We will explain more about these in class.

Course Materials:

We will make few explicit reading assignments. We will use *Ecology*. M.L. Cain, W.D. Bowman, and S.D. Hacker as our main textbook, and copies will be available in the Laighton Library for students to freely consult.

In addition, students will be provided with a field guide to aid in identifying local organisms: *Field Guide to the Atlantic Seashore from the Bay of Fundy to Cape Hatteras*. K.L. Gosner.

Assignments & Grading:

Quizzes in lectures will introduce you to our examination style. One preliminary (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.

Prelim Practical & Written Exam	20%
Final Practical & Written Exam (cumulative)	25%
Class Participation	5%
Quizzes	5%
Project I: Tide Pools	10%
Project II: Intertidal Transect	35%

Students will have an opportunity to review their graded exams, but these will be kept by the faculty.

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 and participating fully in 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). Failure to follow these expectations will affect the grade and may cause referral to the appropriate campus authorities.

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

Positive and Constructive Attitude. Maintaining a positive and constructive attitude and working together in a collegial and productive manner is essential for a successful and enjoyable experience and is expected of all students. This is especially true in a field environment, where flexibility is required.

Personal Technology. Do not use cell phones, smart phones, tablets, mp3 players, headphones, or similar devices in the classroom or during course activities. Computers may be used for taking notes only with the instructor's permission, and only with wireless access disabled during lecture.

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

Transmission of Course Materials. Students are not authorized to replicate, reproduce, copy, post, or transmit lectures, powerpoints, or other course materials presented as part of the course, 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.

Recording Course Materials. Lectures and other class sessions may not be recorded (neither video nor audio) without written consent of the instructors.

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:

Cornell: <http://cuinfo.cornell.edu/aic.cfm>

UNH: <http://www.unh.edu/vpsas/handbook/welcome-university-new-hampshire>

Disabilities and 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.

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 Hamilton House office between 8am – 7pm or knock on the door of Bartels House after hours.

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.
11. Field methods and their application to ecological research projects.
12. Understanding and identification of the organisms that inhabit the rocky intertidal environment of Appledore Island, our natural laboratory.

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Course Schedule

Dr. Jan Factor; Dr. Jed Sparks; Dr. Rick Zechman; TA Jasmin Buteau

- Mon July 29** *(Low tide: 3:01AM, +0.3ft; 3:06PM, +0.8ft)*
- ~2:45 Depart Portsmouth
 - ~4:00-4:15 Class arrives;
 - ~4:30 Introduction to life on Appledore (Fire and Water); class photo; room assignments
 - 5:00 General introduction to course (discussion; all faculty)
 - 6:00 Dinner
 - 7:00-8:00 Geographical and physical environment of Shoals (lecture; Factor)
- Tue July 30** *(Low tide: 3:54AM, -0.2ft; 4:00PM, +0.4ft)*
- 7:30 Breakfast
 - 8:30-10:30 Marine Environments and Organisms: Seaweeds I (lecture; Zechman)
 - 10:30-11:30 General introduction to the laboratory (lab; Factor, Zechman, Buteau)
 - 11:30-12:30 Physics of global climate (Sparks)
 - 12:30 Lunch
 - 1:30-3:30 Marine Environments and Organisms: Marine Invertebrates I (lecture; Factor)
 - 3:30-6:00 Intertidal Ecology I: Introduction to the intertidal environments of Appledore Island: Protected side (field; Factor, Zechman, Buteau)
 - 6:00 Dinner
 - ~~7:00-8:00 Sea table time and identification of organisms (lab; Factor, Zechman, Buteau)~~
 - 7:00-8:00 Seal Cruise
 - 8:00-9:30 Island-wide "Rock Talk": Cynthia Wigren - White shark conservation
- Wed July 31** *(Low tide: 4:46AM, -0.7ft; 4:53PM, 0.0ft)*
- 7:30 Breakfast
 - 8:30-9:30 Population distribution and abundance (Sparks)
 - 9:45-10:15 Introduction to **Project I: Tide Pool Study** (Sparks, Factor, Zechman, Buteau; due Sat, 7:30AM)
 - 10:30-12:00 Marine Environments and Organisms: Marine Invertebrates II (lecture; Factor)
 - 12:30 Lunch
 - 1:30-3:00 Marine Environments and Organisms: Seaweeds II (lecture; Zechman)
 - ~4:00-4:30 FOOD RUN
 - ~~3:30-6:00 Intertidal Ecology II: Intertidal environments of Appledore Island: Exposed side (field; Factor, Zechman, Buteau)~~ >>postponed due to thunderstorm

- 4:30-6:00 Sea table time and identification of organisms (lab; Factor, Zechman, Buteau)
- 6:00 Dinner
- ~~7:00-8:30 Marine Environments and Organisms: Vertebrates (lecture; Factor)~~
- ~~7:00-8:30 Sea table time and identification of organisms (lab; Factor, Zechman, Buteau)~~
- 7:30-8:15 Intertidal Ecology II: Intertidal environments of Appledore Island: Exposed side (field; Factor, Zechman, Buteau)
- 8:30- Study time for Quiz I

Thu Aug 1
*Quiz I

(Low tide: 5:37AM, -1.1ft; 5:46PM, -0.3ft)

- 7:30 Breakfast
- 8:30-8:45 **QUIZ I**
- 9:00-11:00 Marine Environments and Organisms: Marine Invertebrates III (lecture; Factor)
- 11:30-12:30 Demography and life tables, mutualism and commensalism (Sparks)
- 12:30 Lunch
- 1:30-2:45 Marine Environments and Organisms: Marine Algae III (lecture; Zechman)
- 3:00-4:00 Break
- 4:00-6:00 Tide Pool Study: **Data collection** (field; Factor, Zechman, Buteau)
- 6:00 Dinner
- 7:30-9:30 Tide Pool Study: Identifications and data analysis (lab; Factor, Zechman, Buteau)

Fri Aug 2
Whale Watch Day

(Low tide: 6:28AM, -1.4ft; 6:40PM, -0.5ft)

- 6:00-8:30 Intertidal Ecology III: Intertidal environments of Appledore Island Intermediate location (on very low tide) (field; Factor, Zechman, Buteau)
- 8:30 Breakfast on own
- 9:00-9:45 Whale Watch Prep (Buteau)
- 10:00-2:00 Whale Watch**
- 2:00-5:00 Break
- 5:00-6:00 Food webs and trophic cascades (Sparks)
- 6:00 Dinner
- 7:00-10:00 Project/Study Time (Buteau)

Sat Aug 3
*Project I due
*Project II begins

(Low tide: 7:18AM, -1.5ft; 7:34PM, -0.7ft)

- 7:30 **Project I: Tide Pool Study due** 7:30am
- 7:30 Breakfast
- 8:30-9:30 Artist in Residence – Grass Lab
- 9:45-10:30 Awesome brown Algae in all it's magnificence (Zechman)
- 10:30-12:30 Study time
- 12:30 Lunch
- 1:30-4:45 Sea table review/study time (lab; Factor, Zechman, Buteau)
- 5:00-6:00 Marine Environments and Organisms: Marine Invertebrates IV (lecture; Factor)
- 6:00 Dinner

7:00-8:00 Marine Environments and Organisms: Marine Invertebrates IV (lecture; **Factor**)
 8:00-8:30 Q&A review session - Students come prepared with questions
 8:30-on Study Time

Sun Aug 4
 *Prelim Exam

(Low tide: 8:09AM, -1.4ft; 8:29PM, -0.6ft)
 Morning Study time
 9:00-10:00 Dormitory clean up
 10:00 Sunday Brunch
 1:30-3:00 **Practical PRELIM EXAM**
 3:15-4:15 **Individual Written PRELIM EXAM**
 4:30-5:00 **Group PRELIM EXAM**
 5:00 Early Sunday Dinner
 7:00-9:30 *Movie Night!*

Mon Aug 5
Mud Flat Day

(Low tide: 9:01AM, -1.1; 9:27PM, -0.5ft)
 7:30 Breakfast
 8:00 Depart Appledore for Creek Farm
 8:45-11:30 **Mud Flat collecting trip**
 12:30 Lunch
 1:30-3:00 Marine Environments and Organisms: Marine Algae IV (lecture; **Zechman**)
 4:00-5:00 Introduction to **Project II: Intertidal Ecology Project** (lecture and field; part 1, lecture; **Factor**, **Zechman**; data due Fri, reports and presentations due final Sun)
 5:00-6:00 Production, decomposition, and energy flow (**Sparks**)
 6:00 Dinner
 7:00-8:00 Introduction to **Project II: Intertidal Ecology Project** (lecture and field; part 2, field demo; **Factor**, **Zechman**; data due Fri, reports and presentations due final Sun)
 8:00-9:00 Artist-in-Residence: Island-wide Lecture: Robert Grenier (sp?)
 9:00- Return and Discuss Prelim Exam and Tide Pool Project

Tue Aug 6

(Low tide: 9:56AM, -0.7ft; 10:28PM, -0.2ft)
 7:30 Breakfast
 8:30-9:30 Nutrient cycling (**Sparks**)
 9:30-12:30 Intertidal Ecology Project (field #1; low tide: 9:56AM)
 12:30 Lunch
 1:30-2:30 Coral Reef Ecology and Reef Communities (lecture; **Factor**)
 2:30-4:00 Intertidal Ecology Project: Lab time
 4:30-6:00 Community Structure I: Physical environment and influence of abiotic factors on community structure (lecture; **Zechman**)
 6:00 Dinner
 7:00-8:00 Intertidal Ecology Project: Q&A meeting (entire class)
 8:00-9:30 Island-wide "Rock Talk": Jennifer Miksis-Olds – Exploring the Ocean Through Soundscapes

Wed Aug 7
Quiz II

(Low tide: 10:52AM, -0.2ft; 11:32PM, 0.0ft)
 7:30 Breakfast
 8:30-8:45 **Quiz II**

9:00-10:00 Ecology of the global carbon cycle (**Sparks**)
 10:00-12:30 Intertidal Ecology project (field #2 low tide: 11:52AM)
 12:30 Lunch
 1:30-3:00 Community Structure II: Influence of biotic factors on community structure (lecture; **Factor**)
 3:00-4:00 Intertidal Ecology project (Lab and data analysis)
 ~4:00-4:30 FOOD RUN
 4:45-6:00 Isotopes and ecology (**Sparks**)
 6:00 Dinner
 7:00-8:30 Project time
 8:30-9:30 Artist-in-Residence: Class Session: Robert Grenier (sp?)

Thu Aug 8

(Low tide: 11:51AM, +0.3ft)

7:30 Breakfast
 8:30-9:30 Global Change, Impacts and Mitigation Strategies (**Sparks**)
 9:30-12:30 Intertidal Ecology Project (field #3; low tide: 11:51PM), as needed (last low tide before data are due)
 12:30 Lunch
 1:30-6:00 Intertidal Ecology project (Lab and data analysis)
 6:00 Dinner
 6:00-10:00 Project/Study Time

Fri Aug 9

**Data due*

(Low tide: 12:37AM, +0.2ft; 12:52PM, +0.7ft)

7:30 Breakfast
 8:30-12:30 Project Time
 12:30 Lunch
 2:30-5:45 Project Time
 5:45 **Intertidal Ecology Project: Data Due** (Summary data submitted in standard form on provided spreadsheets; **Jasmin** will organize submitted data and distribute all data to all groups.)
Note: The transect forms on yellow, blue, and white sheets will be turned in with the final reports at the time of the presentations. Due on Sunday:
 (1) description of your site;
 (2) analysis of your own data;
 (3) comparison of some aspect with other sites.
 6:00 Dinner
 7:00-10:00 Study Time

Sat Aug 10

**Final exam*

(Low tide: 1:43AM, +0.3ft; 1:55PM, +0.9ft)

7:30 Breakfast
 [Time? Student Research Symposium]
 9:00~10:15 **Practical FINAL EXAM**
 10:30~12:00 **Written FINAL EXAM**
 12:30 Lunch
 1:30-6:00 Intertidal Ecology Project: Data analysis; Presentation prep
 6:00 Dinner
 7:00-10:00 Intertidal Ecology Project: Data analysis; Presentation prep

Sun Aug 11
**Project II due*

(Low tide: 2:46AM, +0.3ft; 2:55PM, +1.0ft)

9:00-10:00 Dormitory clean up
10:00 Sunday Brunch
11:00-1:30 **PROJECT II REPORTS:**
Intertidal Ecology Project Presentations;
Written reports due
~1:30-2:00 Online Course Evaluations (mandatory) – students bring laptops to presentations
2:00-4:00 Lab clean up
5:00 Early Sunday Dinner
6:00-7:00 Slide show
7:30-9:30 Movie night

Mon Aug 12

Students Depart for Portsmouth

7:30 Breakfast
9:00 Luggage on porch no later than 9:00
9:15 Meet at dock for departure
9:45 Class departs Appledore
~11:00 Arrive Portsmouth