



Appledore Island, Isle of Shoals, Kittery, Maine

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**Shoals Marine Laboratory**  
**Marine Environmental Science (BIOSM 1620)**  
**July 5 - 30, 2021**

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**Course Syllabus and Schedule**

***Credits: 3 credits via Cornell***

***Prerequisites:*** Two year-long high school courses in science; completion of grades 10, 11, or 12

***Course goals:***

In Marine Environmental Science, we will explore the diversity of marine organisms, biomes, ecosystems, and the tools scientists use to study them, with an emphasis on topics related to human impacts (including climate change) and environmental health.

By the end of this class, you will be able to:

1. Observe, measure, and characterize seabird behavior and describe their importance as ecological indicators of marine health
2. Describe the diversity and ecology of different coastal marine biomes and define their ecosystem services. Identify previous, current, and future threats to these biomes and ways to protect them
3. Illustrate the complexity of marine food webs and trace the passage of energy and nutrients through ecosystems. Learn about orders of ecological organization and recognize the importance of species interactions for ecosystem function and evolution.
4. Demonstrate proficiency of knowledge about the scientific method by conducting group projects and effectively communicate results and conclusions to peers and instructors.

***Course description:***

The course is organized into four one-week modules, each linked either to an active research program at the Shoals Marine Laboratory or the expertise of the instructors. Each student will work in small groups to conduct a research project using scientific methods to explore their own hypotheses developed through observations of behavior within the tern breeding colony on the adjacent Seavey Island within the Isles of Shoals. This project is feasible because a network of video cameras are currently deployed throughout the nesting colony, allowing for real-time observations.



**Cornell University**



**University of  
New Hampshire**

**Course description (continued):**

Virtual coursework will include exploring various marine biomes, observing seabird colonies, learning about marine ecosystems, and working cooperatively with peers to complete assignments and projects. Exercises will include several labs and activities to help familiarize students with sea bird ecology, various marine biomes, food web dynamics, and phytoplankton diversity. Lectures and discussions will expose students to topics in marine ecology, oceanography, and climate science. Finally, we will study how humans have impacted the ocean and discuss how we can be stewards of marine ecosystems.

**Modules:**

- 1. Introduction to Shoals, science and seabirds**
  - I. Introduction to the scientific method
  - II. Introduction to the group research projects
  - III. Seabird biology and ecology
- 2. Coastal marine biomes**
  - I. Ecology and diversity of coastal marine biomes
  - II. Ecosystem services
  - III. Threats, protection, and restoration
- 3. Microbes, plankton, and community ecology**
  - I. Marine microbial community diversity and function
  - II. Energy flow and food webs
  - III. Community ecology
- 4. Conservation, climate change, and project presentations**
  - I. Conservation and sustainability
  - II. Global climate change
  - III. Group presentations

**Course materials:**

A computer with internet connectivity is required for attending class and rock talk lectures, participating in group work, completing lab exercises, and working with data. Our learning management system will be *Canvas*, by Instructure. We will distribute instructional materials, track assignments, and return feedback using this platform.

**Assignments & grading:**

Grades for this course will be based upon student mastery of learning objectives within each of the four units plus the research project. Overall performance will be weighted across these units as follows:

Module 1: Seabirds	100 Points/16%
Module 2: Coastal marine biomes	100 Points/16%
Module 3: Plankton + ecology	100 Points/16%
Module 4: Conservation + climate	75 Points/12%
Participation	100 Points/16%
Research Project	150 Points/24%

During each module, students will receive a rubric of expectations and point totals for individual assignments. These will include categories such as: lab activities, reading reflections, homework assignments, peer editing, oral presentations, scientific writing, preparation for synchronous meetings, debates, data analysis, contribution to group discussion (live and virtual), tests/exams, attendance at Shoals “Rock Talks” (SML guest lectures on various topics), and other work as may be assignment by the instructors.

***Expectations and conduct:***

Students are responsible for fully understanding all the information presented in this syllabus. If there are any questions regarding this information, it is the student’s responsibility to ask the instructors. Students are responsible for attending all activities associated with this course and completing all assignments. Students are encouraged to ask questions frequently for clarification and/or enrichment. Every student is responsible for their own behavior. This course will offer a safe and respectful space for learning and interaction for all students and we expect all students to follow this code. Students are responsible for fully understanding and adhering to all of the information presented in the SML Appledore Handbook:

<https://www.shoalsmarinelaboratory.org/campus>.

***Zoom etiquette***

- Your Zoom screen name must match the name under which you are enrolled in the course (although you may append a nickname you prefer). Please include preferred pronouns.
- Participation is a key aspect of this course. We strongly encourage you to keep your webcam on to the maximum extent appropriate. If it is off, we will assume you have stepped away from the classroom.
- Please mute your microphone *only* if there are distractions in your zoom location.
- Do not record or share zoom sessions or other information without permission.
- Your attire, language, and background should be professional and respectful.
- Minimize distractions and “be present” by putting away phones and unrelated work.
- Improve clarity by speaking deliberately and using good lighting (behind your camera).
- Be explicit and animated with your non-verbal communication: nodding, thumbs up, hand-raising.
- Participate with grace & humor. Suspend judgement and be willing to try new things!
- *Personal Technology use.* Please do not take notes on a laptop as there is ample research showing it inhibits learning compared to taking notes by hand (e.g. Muler and Oppenheimer 2014). Allowances are made for any student with a learning plan that specifies accommodations for typing class notes. In this case it will be expected that you have a second screen/monitor for Zoom and note-taking windows.

**Transmission of course materials:**

Students are not authorized to copy, record, replicate, reproduce, 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 instructor who is either the original source of the materials or is using them with permission of their original authors.

**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 website, or a published paper. Students must adhere to the policies of Cornell and UNH for Academic honesty, plagiarism and discrimination. Please use APA formatting for citations and reference lists.

Cornell: <http://theuniversityfaculty.cornell.edu/academic-integrity/>

UNH: <https://www.unh.edu/student-life/09-academic-honesty>

**Disabilities & ADA accommodation:**

Students with a disability must contact Cornell's (420 CCC building; 607-254-4545) or UNH's Student Disability Services <https://www.unh.edu/studentaccessibility> prior to start of class for confidential discussion of needs and for registration to verify eligibility for academic accommodations.

**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.

**Schedule:**

Students should expect to devote 2 hours per day, Monday – Friday, in the virtual classroom and another 1-2 additional **hours** per day working on their assignments and research projects.

Synchronous activities will typically occur between 9am and 11:10am (Eastern Standard Time, UTC-5) Monday – Friday, with a daily ten-minute break at 10 am. In addition, students are expected to attend SML Rock Talks on Tuesday nights at 7:30pm (EDT) or view recordings of these talks if they are within a different time zone. Under extenuating circumstances, a student who misses a synchronous meeting may review a recording of that session accessible on Canvas. We are unable to record breakout rooms during synchronous classes, so this is only a partial solution.

Weekends will mostly include asynchronous work (**e.g.** research projects). Asynchronous activities have deadlines and due dates but may otherwise be completed at the student's pace and schedule.

Instructors will present the students with a more specific schedule for synchronous meetings at the beginning of each week.

## **Schedule of Events: Marine Environmental Science 2021**

### **Week 1: Introduction to Shoals, science, and seabirds (week of July 5)**

**Summary of objectives:** During the "Science and Seabirds" module, students will get an overview of the course structure, the scientific method, and seabird biology. Students will learn how to navigate and operate in the virtual classroom and come to understand course expectations including the syllabus and schedule. During this week students will also be introduced to the scientific method and the differences between experimental and observational research. Students will use the scientific method to design an observational study using video footage of SML's breeding tern colony. Lastly, in order to aid their observational study, a series of lectures and guest lectures from researchers working at SML will provide background information on seabird ecology, conservation, behavior and anatomy.

### **Week 2: Coastal marine biomes (week of July 12)**

**Summary of objectives:** During this module, students will learn about the diversity and ecology of various coastal marine biomes including coral reefs, mangroves, salt marshes, and the rocky intertidal. Students will be able to describe the defining characteristics and attributes of each biome and identify keystone and engineering species that contribute to the functioning of each biome. Students will learn about the important ecosystem services of these biomes and the previous, current, and future threats to these biomes (natural and anthropogenic) through lectures and by completing an array of interactive, virtual activities. Students will also learn about ongoing restoration efforts to protect these biomes from further degradation.

### **Week 3: Microbes, plankton, and community ecology (week of July 19)**

**Summary of objectives:** During this module, students will learn about how marine microbial communities and phytoplankton fuel primary production and organic matter cycling in marine food webs. Students will also learn about the diversity of organisms identified as plankton and understand how energy flows through marine food webs. Students will also explore important aspects of community ecology, trophic cascades, and species interactions that influence species survivorship, natural selection, and ecosystem function.

### **Week 4: Conservation, climate change, and project presentations (week of July 26)**

**Summary of objectives:** During this module, students will explore topics relevant to conservation and sustainability in the modern world. Students will also learn about global climate change and the current and future impacts of climate change on marine environments. Additionally, students will receive more time and support to complete their group research projects and they will present their research to instructors and peers.