

**Marine Ecosystem Research and Management (MEFB 508/BIOSM 3750) Shoals
Marine Laboratory, July 1-15, 2024**

Prerequisites:

One semester of college biology or equivalent

Credit hours:

3 (Cornell) and 4 (UNH)

Key learning outcomes:

- Apply core ecological concepts to marine ecosystems
- Address a real-world management problem
- Learn common field sampling techniques for marine systems
- Collaborate across disciplines to design, conduct, and integrate research projects
- Effectively communicate research results and advice

An “A” in this course means:

- Active participation every class: You ask questions and contribute comments during lectures & discussions
- You apply in-class material to homework, quizzes, projects, and research
- You collaborate on research with peers: working in a team to identify central questions and conduct analysis, accepting feedback, and telling clear research stories

Faculty:

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TA, EMAIL

The faculty conduct ecosystem research and apply the results to management of fisheries and conservation of seabirds and marine mammals. We are excited for you to join us in Marine Ecosystem Research and Management (MERM)! Reach out via email with any questions about the material in this syllabus.

Course Description:

Students will conduct field sampling and data analysis to contribute to a research collaboration and final presentation. Field sampling ranges broadly, from ocean conditions, phytoplankton, and zooplankton to fish, terns, and seals. We will incorporate diverse stakeholder perspectives and how to effectively communicate results in a professional setting. Students integrate their research findings and recommend specific management actions to an expert panel and public audience. Students acquire skills to effectively address conservation questions with an ecosystem-based approach.

Shoals Marine Lab Information:

Shoals Marine Lab is a remote field station off the New England coast. Please bring everything you might need with you to the island. [Shoals provides a suggested packing list.](#) A personal laptop is required for this course. There are no required textbooks.

While on island, we have limited access to medical care, so please be careful when moving around the island. We care 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 and are committed to making students feel safe, comfortable, welcome, and included at all times on Appledore Island. Find staff in the office on the second floor of Hamilton Hall between 8am-7pm or knock on the door of Bartels House after hours.

Students with disabilities requesting accommodations must contact the appropriate disabilities services office at least four weeks prior to the start of class for confidential discussion of needs and for registration to verify eligibility for academic accommodations. No retroactive accommodations can be made. Cornell and high school students: <https://sds.cornell.edu/forms>; UNH and all other college students: <https://www.unh.edu/studentaccessibility/students-0>.

Shoals provides meals in the Commons at the following times:

Monday-Saturday		Sunday	
Breakfast	7:30AM	Brunch	10:00AM
Lunch	12:30PM		
Dinner	6:00PM	Dinner	5:00PM

Rock Talks: Students are encouraged to come to the Tuesday “Rock Talk” (island-wide guest speaker seminar) at ~8:00PM in the Commons.

Food Run: Every Wednesday is an Island-wide “Food Run” at ~4:00PM. All students and faculty help unload food from the boat. This food will be used throughout the week.

Cleaning: Sunday mornings before brunch, students are expected to work together to tidy their dorm rooms and shared dorm spaces. Students will help clean the classroom on the final day of the course.

Expectations and Conduct:

Students are responsible for the material in this syllabus and the [Appledore Island Handbook](#). Students should carefully read both for understanding, and reach out to instructors with any questions.

Classroom expectations: On the first day of class, we will collectively make a set of in-class guidelines and expectations. Our expectation is that in class and on island,

How you will be graded:

Homework (4):	20%
Quizzes (2):	20%
Paper discussion (1):	20%
Project and presentation (1):	40%

students should be respectful and collegial to other students and with instructors. Students are responsible for participating actively in all activities associated with this course and completing all assignments. The full course schedule can be found on Page 7 of this syllabus, but may change. Instructors will write the most up-to-date daily schedule in the Commons each day.

Personal technology: To contribute to a positive learning environment, we ask that students do not use personal technology (e.g., cell phones) during class.

Academic Integrity: All students are expected to adhere to [Cornell](#) and [UNH Policies](#) for Academic Integrity, Honesty, and Plagiarism. See Cornell's policy and UNH's policy. This includes submitting work that is wholly your own. Uncredited use of another person's words, data, or images is considered plagiarism, whether the material comes from another student, a website, or a published paper.

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. During the course, you will sign a data sharing agreement related to all data which you may use.

Assignments & Rubrics:

A note on rubrics: We use the rubrics to state how we will grade your work.

Homework: There are four homework assignments during the course. The homework will be building blocks of the final project and presentation. In general, homework will be completed in class and due at the end of the class session. Homework will be graded on timeliness (turned in on time) and completeness (each specific question has an answer). We will not grade content because we want students to practice the building blocks and not worry about getting the "right" answer. Instead, students will receive oral/written feedback, which can be applied to the final project. Homework is worth 20% of the final grade.

Quizzes: Two quizzes will each consist of three short answer questions covering the lectures and readings. Quizzes are open notes, in class, and last one hour. Extra time will be given if necessary. Students can use notes and materials from the class.

Questions will emphasize broad concepts, not rote memorization. Students will receive oral/written feedback on their answers. Quizzes are worth 20% of the final grade.

Paper Discussion: Pairs of students will act as Discussion Leaders. As Discussion Leaders, students will read and critically evaluate current papers assigned from the primary literature. Results of their interpretation will be presented (~30 minute discussion sections) to the class in the form of an organized discussion: Discussion Leaders will provide an overview of the paper, results, and prompt other students to discuss the paper by providing questions. All students are expected to participate in discussing these papers by asking and answering questions. Grades will be assigned to both the Discussion Leaders and for student participation based on the following rubric. The paper discussion is worth 20% of the final grade.

Points per category (max 10 per category)	Discussion Leaders	Discussion Participants
10	<ul style="list-style-type: none"> ● Effectively identifies & summarizes main points ● Synthesizes concepts from class and demonstrates critical thinking ● Provides thoughtful questions for group to discuss ● Discussion time split appropriately between partners ● Presentation is clear and effective (strong presentation skills) 	<ul style="list-style-type: none"> ● Actively listens to Discussion Leaders ● Engages on answering multiple questions ● Provides thoughtful responses to questions ● Supportive of other students' ideas ● Positive, cooperative attitude
9	<ul style="list-style-type: none"> ● Identifies and summarizes main points ● Some synthesis of class concepts and/or critical thinking ● Provides basic questions for group to discuss ● Discussion time split appropriately between partners ● Presentation skills could be improved (e.g., reading off 	<ul style="list-style-type: none"> ● Actively listens to Discussion Leaders ● Engages on answering a few questions ● Intermediate positive, cooperative attitude ● Intermediate support of other students' ideas

	slides, excessive text on slides)	
8	<ul style="list-style-type: none"> ● Identifies and summarizes some but not all main points ● Limited synthesis of class concepts ● Only 1-2 questions for the group to discuss ● Discussion time split unequally or inappropriately between partners ● Presentation is unclear or hard to follow ● Distracting factual errors 	<ul style="list-style-type: none"> ● Distracted and/or not actively listening to Discussion Leaders ● Engages on answering one question ● Limited participation ● Sometimes supportive of other students' ideas

Project and presentation: Students work as a team to conduct an integrated environmental and biological research project that has direct management implications. The overall project will combine multiple smaller projects focused on sustainable fisheries, marine bird and mammal conservation, community ecology, and biological oceanography. All smaller projects must have a direct link to the dominant forage fish species, Atlantic herring. The final integrated project must then examine and balance multiple objectives (e.g., sustainable fisheries, marine bird and mammal conservation) and make informed management recommendations for 2024. In this sense, the class's integrated project is at the core of ecosystem-based management of the region.

Students will work in small groups to sample a variety of ecosystem components (oceanography, plankton, fish, terns, and seals) and work closely with the instructors to formulate research questions and the appropriate analytical approaches to answer the questions. The project offers students an opportunity to detect patterns, test specific hypotheses, and relate pieces of the ecosystem into a holistic project. Each student will work through all aspects of a research project including hypothesis formulation, data collection, analysis and interpretation, and communicating conclusions through a public presentation.

The course will culminate in a public presentation to a panel of experts involved in fisheries and marine resources in the Gulf of Maine. Each student pair will present the results of their small group work (5-10 min each) and the class will work together to present an integrated project summary (15 min) that includes providing management recommendations. All students will participate in the oral presentation. Points for this work will be awarded based on the following rubric. The project & presentation is worth 40% of the final grade.

Points per category (max 10 per category)	Project Content	Presentation Skills
10	<ul style="list-style-type: none"> ● Clear research story that is easy to follow and presents the information in a logical sequence ● Data is presented in an easy to understand visual ● Statistical tests are provided & clearly interpreted ● Management suggestions make sense given results ● Student includes at least one ecological concept from the course in the project ● Improves project based on feedback from instructors ● No factual errors 	<ul style="list-style-type: none"> ● Speaker shows preparation and practice ● Speaker uses clear voice and can be heard by audience ● Presentation is easy to read and images are not distracting ● Uses presentation techniques discussed in class (e.g., layering) ● Uses assigned length of time appropriately and time is split appropriately between partners ● Contributes to group project sections (Intro & Conclusions) ● Answers at least one question during the Q&A after the presentation
9	<ul style="list-style-type: none"> ● Research story is easy to follow, presents information in logical sequence ● Data is presented in an easy to understand visual format ● Statistical interpretations are provided but communication could be improved ● Some management suggestions, but not clear how they are supported by the research ● Student includes one ecological concept from the course in the project ● Improves project based on feedback from instructors ● Minor factual errors 	<ul style="list-style-type: none"> ● Speaker shows preparation and practice ● Speaker's voice is clearly heard most of the time ● Presentation skills could be improved (e.g., reading off slides, excessive text on slides) ● Presentation is hard to read and/or images are distracting ● Sometimes does not use discussed presentation techniques ● Uses assigned length of time appropriately, and time is split appropriately between partners ● Contributes to group sections (Intro & Conclusions) ● Answers at least one question during the Q&A after the

		presentation
8	<ul style="list-style-type: none"> • Research story sometimes is hard to follow • Data presentation/visual is somewhat difficult to understand • Data analysis and interpretation sometimes are inappropriate • Management recommendations not supported by the research • No ecological concept from the course included in the project • Only some improvement based on feedback from instructors • Distracting factual errors 	<ul style="list-style-type: none"> • Speaker shows little preparation and practice • Speaker cannot be clearly heard some of the time • Presentation skills could be improved (e.g., reading off slides, excessive text on slides) • Presentation is hard to read and/or images are distracting • Does not use discussed presentation techniques • Does not use assigned time appropriately, and time is split unequally or inappropriately between partners • Does not contribute to group sections (Intro & Conclusions) • Answers no questions during the Q&A after the presentation

Daily Schedule:

(Subject to change based on weather, [boat availability](#), tides, instructor's discretion, etc. Instructors will write the most up-to-date schedule in the Commons each morning.)

DAY	MORNING	AFTERNOON	EVENING
Sun Jun 30			6:15 - Faculty meeting
Mon Jul 1		STUDENTS and faculty: Arrive 4 pm at Shoals Marine Laboratory	Course Introduction ; Community agreements
Tue Jul 2	8:30 - What does "management" mean to you? (discussion); What is an ecosystem? (E. Siddon); Gulf of Maine overview (Sigler); Lab: Ecosystems	1:30 - Ecosystem Status Reports (E. Siddon); Lab: Ecosystem Indicators ; Ecosystem component choices ; Discussion paper choices ; Discussion paper instructions	8:00 - Rock Talk (TBD)

Wed Jul 3	8:30 - Write testable hypotheses ; HW1 : Identify your small group question, hypothesis, and mock graph Project template	1:30 - Lab: Juvenile fish (beach seine) sampling, New Castle Beach (Heiser, inflatable); 3:33 low tide 0.8 ft (Heiser) 4:00 - Food run	7:00 - Steller sea lion foraging (Sigler)
Thu Jul 4	8:30 - Trophic control (E. Siddon); Seasonality and location matters (Sigler) 11:00 - Set up R	1:30 - Work on discussion papers	7:00 - Herring and lobster fisheries (C. Siddon)
Fri Jul 5	8:30 - Ecosystem data analysis (C.Siddon / Sigler) 10:30 - Discuss papers (2); Discussion paper reflection	1:30 - Discuss papers (2) 3:00 - Dry run seal count on land (e.g., count gulls from Loughton porch); 4:00 - Lab: Seal survey , 5:18 low tide 0.8 ft; seal survey	7:00 - Fisheries cont. (C. Siddon)
Sat Jul 6	8:30 - Lab: Data analysis 11:00 - Discuss papers (2)	1:30 - Quiz 1 (in class) 3:00 - Prepare project outline (question/hypotheses/plots)	7:15 - Lab: Neuston net sampling (Heiser)
Sun Jul 7	10:00 - Brunch; 11:00 - Present your project outline (overall question, hypotheses, plots) 1:30 - 4:30 Lab: White Island visit (high tide 1:10, 8.3 ft)		5:00 - Dinner; 1800 - Faculty meeting; What I need (WIN) time
Mon Jul 8	8:30 - Data management (C. Siddon); 9:00 Use available data and make plots for your project	1:30 - CTD and bucket sampling (Heiser); Continue making your plots	7:00 - Present your plots (Chris call in); HW2
Tue Jul 9	8:30 - Begin data analysis	1:30 - Seal Biology and Conservation (Bogomolni)	8:00 - Rock Talk (C. Siddon)

	10:30 - Sarah Gaichas: Gulf of Maine ecosystem model, Lecture and Lab ; NOAA fish distribution app	3:00 - Data analysis; HW3	
Wed Jul 10	8:30 - Lab: Foraging and energy density ; 8:56 low tide, -0.3 ft; 11:00 - Present data analysis	1:30 - Quiz 2 (in class); 3:00 - Present data analysis 4:00-4:30 food run	7:00 - Artist in Residence (TBD)
Thu Jul 11	8:30 - Community Science, Outreach and Engagement (E. Siddon); How to prepare a presentation (Sigler) 10:00 - Discuss management implications	1:30 - Present management implications; HW4 ; The expectation is that your small group presentation is drafted once you complete HW4	TBD
Fri Jul 12	8:30 - Practice small group presentations; 10:00 - 3:00 Whale Watch (on dock @ 9:45, optional) (learn whale and seabird survey methods)	3:30 - Practice small group presentations	7:00 - Prepare integrated presentation
Sat Jul 13	8:30 - Prepare integrated presentation	1:30 - Practice integrated presentation and answering questions	Revise integrated presentation
Sun Jul 14	9:00 - Tidy living spaces; 10:00 - brunch; 11:00 - store open; 12:00 - PRESENTATIONS to management panel; 2:00 - Course evaluations, classroom and lab cleanup; 3:00 MERM commencement		5:00 - dinner
Mon Jul 15	Students clean rooms; Depart @10:00am		

First day of the course schedule:

Check in at the SML dock in Portsmouth, NH	1:00PM
Depart Portsmouth	2:00PM
Arrive on Appledore Island	~4:00PM
Welcome & Orientation with SML Staff	~4:30PM

Last day of the course schedule:

Bags packed & on dorm porch	8:30AM
Meet at dock	9:15AM
Depart Appledore Island	9:30-9:45AM
Arrive at the SML dock in Portsmouth, NH	~10:30-11:00AM

Equivalent note:

Cornell students, this course fulfills the following requirements:

- Environment and Sustainability majors: Capstone requirement
- Biology majors, Marine Biology concentration: Meets both Group B - Advanced topics requirement and Fieldwork requirement.

UNH students, this course fulfills the following requirements:

- Marine Estuarine and Freshwater Biology majors: Electives requirement