

Shoals Marine Laboratory
Marine Environmental Science (BIOSM 1620; Section 2)
July 15-29, 2019

Course Syllabus and Schedule

Faculty:	Blaine S. Kopp, PhD	bkopp@kua.org
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Prerequisites:	Two year-long high school courses in science and completion of grades 10, 11 or 12	

Class enrollment limit: **20** **Credit: 3 credits through Cornell**

Course Objectives/Goals:

Environmental studies have become an integral component of high school programs all around the country; however, opportunities to apply this course work to the marine environment are limited. Marine Environmental Science will explore the diversity of coastal marine habitats and ecosystems and the tools scientists use to study them, with an emphasis on topics related to human impacts and environmental health.

Fieldwork will include explorations along Appledore's rocky intertidal zone, excursions to neighboring islands to observe seal and seabird colonies, and offshore trips to practice oceanographic sampling techniques and observe whale foraging grounds. Laboratory exercises will include observation and identification of plankton under the microscope, and familiarization with invertebrate and vertebrate adaptations through observation and dissection. 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.

A major component of this course is a group research project, in which students are expected to apply the scientific methods they have practiced in the field and lab to address a research question of their own design on Appledore.

Course Materials:

If possible, we highly recommend bringing a laptop computer for writing papers, completing lab exercises, and working with data. Google Classroom will be used as a learning management system and as a way to distribute instructional materials to reduce excessive printing. Lecture notes will be taken by hand (not laptops) in a notebook for access during the Final Exam. We also require sturdy, close-toed shoes (or muck boots) for work in the intertidal zone.

Assignments & Grading:

- a. Assignments: Each student will write one Laboratory Report, constituting 20% of the final grade. Within small groups, each student will also design and carry out a research project that will constitute 30% of the final grade (20% based on individual research paper, 10% based on group oral presentation). Rubrics will be provided for all required assignments so all expectations for grading are clear.

- b. Assessments: There will be laboratory practical tests, constituting 20% of the final grade, and a final exam (open-note) also constituting 20% of the final grade. Mandatory group study sessions will precede assessments.
- c. Full and active participation, including active reading of assigned readings and preparation for a class exercises, constitutes 10% of the final grade.

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.

Every student is responsible for their own behavior- specifically maintaining a safe experience for themselves and others, and 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

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

- a. *Personal Technology During the Workday.* Do not use cell phones, smart phones, iPads, mp3 players, headphones, or similar devices in the classroom or during course activities unless expressly asked to do so. Please do not plan on taking notes on a laptop as there is ample research showing it inhibits learning compared to taking notes by hand (even compared to not taking notes at all, although that will not be acceptable for this course either; e.g. Muler and Oppenheimer 2014). Allowances are made for any student with learning a plan specifying an accommodation for typing class notes, in which case it will be expected that wireless access during lecture. Personal computers/laptops will be useful for course activities.
- b. *Computing.* Shoals Marine Lab has a modest computer facility in Leighton Library. Please treat this shared facility with respect. Printers are available, but please limit printing to your FINAL documents and only as required. See also, *Course Materials* and *Personal Technology* sections above.
- c. *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.
- d. *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 the policies of Cornell and UNH for Academic honesty, plagiarism and discrimination.
 - i. Cornell: <http://theuniversityfaculty.cornell.edu/academic-integrity/>
 - ii. UNH: <https://www.unh.edu/student-life/09-academic-honesty>

- e. *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>) 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.
- f. *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.

Schedule:

Daily schedules at Shoals Marine Laboratory are flexible in order to accommodate predictable events (e.g. tides), unpredictable events (e.g. weather) to take advantage of unforeseen opportunities to experience the marine environment, and to participate in campus-wide marine science lectures and field opportunities. As a result, MES's daily routine may include early morning field or lab work.

Three meals are served on the island each day, except Sunday, when schedules are more relaxed and begin after a mid-morning brunch. Between meals, students should expect to be fully engaged in lectures, fieldwork, and laboratory exercises each day. After dinner and outside of formal class hours, students may be expected to study for lab practicals, work on research projects, or attend guest lectures and films.

Island Life:

Days on Appledore are filled with academic endeavors, but students do have free time around meals when they can use the island's volleyball court, swimming area, or library. SML encourages MES participants to interact with the entire island community. Musicians should feel free to bring an instrument to the island and share a song with other students, faculty and staff. Additionally, one morning or afternoon each week, students join in a general cleaning of the island and its facilities.

Schedule of Events: Marine Environmental Science Section 2, 2019

Day 1: Monday, July 15

16:00	Student arrival	unpack-dorm
16:30	Island Intro	Fire and water/Facilities tour
18:00	Dinner	
19:00	Hamilton	Course introduction & scientific observation
20:00	Field	Appledore sunset orientation hike + ice breakers (bring flashlight, sunset 20:21)
22:00	Dorms	Sleep on it: Plans for research projects

Day 2: Tuesday, July 16

07:30	Breakfast	
08:30	Hamilton	Discussion: What are the most pressing marine environmental concerns facing humanity? Breakout groups to focus in on select topics.
10:00	Hamilton	Lecture: Ocean environment – tides and the intertidal, biotic and abiotic factors that structure the intertidal
11:00	PK Lab	Lab: Abiotic factors that structure the intertidal: Appledore wind, fetch, & wave analysis
12:30	Lunch	
13:30	Hamilton	Lecture: Diversity & adaptation of marine organisms / tree of life / phylogeny
14:30	Hamilton	Lecture: Diversity of intertidal life: intro to macroalgae
16:00	PK Lab	Fieldwork: collection of intertidal invertebrate and macroalgae 17:41 low tide (+0.9 ft).
18:00	Dinner	
19:00	Hamilton	Brainstorm group project ideas
20:00	Kiggins	Rock Talk. Mike Marchand. Two rocks, three terns: restoring HH's Terms.
22:00	Dorms	Sleep on it: Differences between life on exposed vs. sheltered shores

Day 3: Wednesday, July 17

07:30	Breakfast	
08:30	Hamilton	Lecture: Diversity of intertidal life: intro to invertebrates
10:00	PK Lab	Lab: Identification of intertidal macroalgae and invertebrates. Create class list
12:30	Lunch	
13:30	Hamilton	Lecture: Physical oceanography – thermohaline circulation
14:30	PK Lab	Lab: ocean and estuarine layering
16:00	Dock	offload the food run
16:30	PK Lab	Group study for lab practical on intertidal organism identification
18:00	Dinner	
20:00	TBD	Film: <i>Signals for Survival</i>
22:00	Dorms	Sleep on it: Group project ideas

Day 4: Thursday, July 18

07:30	Breakfast	
08:30	Hamilton	Lecture: Physical oceanography – Coriolis and wind-driven circulation
10:00	Hamilton	Workshop: Research project outline
12:30	Lunch	
13:20	Dock	Physical, chemical and biological (plankton) water sampling R/V Kingsbury. Slip lines at 13:30 – returning approx. 17:00
17:00	PK Lab	Lab: Phytoplankton and zooplankton exploration
18:00	Dinner	

19:30	PK Lab	Lab: Analysis of phys/chem water quality data from today's cruise
22:00	Dorms	Sleep on it: How would you clean up an oil spill in the Gulf of Mexico? How about the North Slope of Alaska?

Day 5: Friday, July 19

07:30	Breakfast	
08:30	Hamilton	Lecture: Cetacean biology
09:50	Dock	Whale watch. R/V Kingsbury. Slip lines at 10:00 – return approx. 14:00
15:00	PK Lab	Lab: oil pollution / oil spills (bring a feather)
16:30	Hamilton	Lecture: marine invasive species
18:00	Dinner	
20:00	TBD	Film: Chasing Coral
22:00	Dorms	Sleep on it: Do you think the plankton community will be different at night? How?

Day 6: Saturday, July 20

07:30	Breakfast	
08:30	PK Lab	Fieldwork/Lab: exploring for invasive species on SML floating dock and in the intertidal (low tide 08:17)
09:30	PK Lab	Lab: back in the lab to examine and document what we have found
11:30	Hamilton	Lecture: Dr. Liz Craig on tern restoration, monitoring and research at While Is.
12:30	Lunch	
13:50	Dock	White Island tern restoration monitoring and research. R/V Kingsbury or Heiser). Slip lines at 14:00 – return approx. 17:00
18:00	Dinner	
18:50	Dock	Nighttime plankton tows R/V Kingsbury. Slip lines at 19:00 – return approx. 21:00
22:00	Dorms	Sleep on it: How would you go about “restoring” a species in decline/at risk? Bring back the egrets?

Day 7: Sunday, July 21

09:00	Dorm	Dorm clean-up
10:00	Brunch	
11:00	PK Lab	Lab: Daytime/nighttime plankton data comparison
12:00	PK Lab	Lecture/lab: A plan to bring back the Snowy Egrets. Build decoys, select nesting sites and deploy decoys
15:00	Hamilton	Lecture: introduction to soft-bottom intertidal communities
16:30	PK Lab	Walk about to tour nesting site deployments
17:30	Dinner	
18:15		Faculty meeting
19:00	Boat	Sunset trip to Star Island for ice cream (bring \$\$)
22:00	Dorms	Sleep on it: How will sea level rise affect the ecology of Appledore?

Day 8: Monday, July 22

07:30	Breakfast	
07:55	Dock	Soft-bottom intertidal communities in Portsmouth (Sagamore Farm Creek or Fishing Island) R/V Kingsbury. Slip lines at 8:00 – return approx. 12:00
12:30	Lunch	
13:30	Hamilton	Lecture: Sea level rise and other threats to marshes
15:00	TBD	<i>Lesson: TA's choice</i>

16:30	PK Lab	Lab: Practicing with quadrats
18:00	Dinner	
20:00	TBD	Evening program
22:00	Dorms	Sleep on it: are you ready to ID intertidal organisms?

Day 9: Tuesday, July 23

07:30	Breakfast	
09:00	PK Lab	Intertidal transect lab. Low tide 10:53 (+0.8 ft) – return approx. 12:00
12:30	Lunch	
13:30	Hamilton	Lab: Intertidal data analysis
15:00	Hamilton	Lab: Group work on intertidal transect reports high vs low energy
16:30	TBD	Group work to prepare transect report, due tomorrow 08:30
18:00	Dinner	
20:00	Kiggins	Rock Talk: Sarah Gaichas. NOAA Research Fisheries Biologist
22:00	Dorms	Sleep on it: Should <i>all</i> marine mammals receive protection from hunting?

Day 10: Wednesday, July 24

07:30	Breakfast	
08:30	Hamilton	Workshop: Marine mammal debate prep
09:30	Hamilton	Workshop: Echolocation Activity
10:50	Dock	Seal monitoring at Duck Island with Marine Mammal Interns Aye & Holly Vessel TBD. Slip Lines at 11:00 – return approx. 12:00
12:30	Lunch	
13:30	Hamilton	Activity: Marine mammal debate
14:00		
16:00	Dock	offload food run
16:30	TBD	<i>Lesson: TA's choice</i>
18:00	Dinner	
20:00	TBD	Evening program
22:00	Dorms	Sleep on it: What can <i>you</i> do about marine debris?

Day 11: Thursday, July 25

07:30	Breakfast	Lecture: Ocean plastic and marine debris
08:30	PK Lab	Fieldwork: marine debris survey
10:00	Hamilton	Lecture: Marine Conservation Part 1
12:30	Lunch	
14:00	PK Lab	Lab: marine debris data reduction and analysis
15:30	Hamilton	Lecture: Marine Conservation Part 2
18:00	Dinner	
20:00	TBD	Film: A Plastic Ocean
22:00	Dorms	Sleep on it: Fish for dinner? Is it healthy? Sustainable?

Day 12: Friday, July 26

(alternate date for whale watch if necessary due to weather)

07:30	Breakfast	
08:30	Hamilton	Lecture: Fisheries – past, present & future

10:00	Lab	Project time. Prepare for your presentations
12:30	Lunch	
14:00	Hamilton	Lecture: Fish – Hg, PCBs and other contaminants
15:30	Hamilton	Lab: Sustainable seafood
18:00	Dinner	
20:00	TBD	Evening program
22:00	Dorms	Sleep on it: Ready to present?

Day 13: Saturday, July 27

07:30	Breakfast	
08:30	Hamilton	Presentations: MES2 Research Symposium
12:30	Lunch	
13:50	Dock	Demersal fishing: methods, gear impacts and collection for fish anatomy. R/V Kingsman. Slip lines at 14:00 – return approx. 16:00 Otter trawl, pipe dredge, and hagfish trap retrieval or rod & reel
16:30	PK Lab	Dissection of squid, dogfish and hagfish
18:00	Dinner	
22:00	Dorms	Sleep on it: Are your course logs in order?

Day 14: Sunday, July 28

09:00	Dorm	Dorm clean-up
10:00	Brunch	
11:00	Hamilton	Final EXAM
14:30	PK Lab	Experimental write-ups due Fish print class shirts
16:00	PK Lab	Lab clean-up
17:30	Dinner	
19:00	Boat	Sunset trip to Star Island for ice cream (bring \$\$)
20:00	TBD	Slide show-a look back!
20:30	TBD	Evening program
22:00	Dorms	Sleep on it: What a Trip we had!

Day 15: Monday, July 29

07:30	Breakfast	
08:30	Hamilton	Evaluations/info exchange
09:30	Dock	Final good-byes. Depart Shoals. Slip lines at 9:45

NOAA/NOS/CO-OPS Tide Predictions at 8427031

Gosport Harbor, Isles of Shoals NH

Date		High				Low				☀		☾
		AM	ft	PM	ft	AM	ft	PM	ft	Rise	Set	Moon
14	Sun	10:10	8.3	10:20	9.6	4:03	-0.1	4:08	0.8	5:11	8:22	☉
15	Mon	11:01	8.3	11:07	9.6	4:53	-0.2	4:56	0.8	5:12	8:21	☉
16	Tue	11:48	8.3	11:52	9.5	5:39	-0.2	5:41	0.9	5:13	8:20	☉
17	Wed			12:32	8.3	6:23	-0.2	6:24	0.9	5:13	8:20	☉
18	Thu	12:33	9.4	1:12	8.3	7:03	-0.1	7:04	1.0	5:14	8:20	☉
19	Fri	1:13	9.3	1:51	8.2	7:40	0.1	7:44	1.1	5:15	8:19	☉
20	Sat	1:51	9.1	2:29	8.2	8:17	0.2	8:24	1.2	5:17	8:17	☉
21	Sun	2:30	8.8	3:07	8.2	8:53	0.4	9:05	1.3	5:18	8:16	☉
22	Mon	3:11	8.6	3:47	8.2	9:31	0.6	9:49	1.3	5:19	8:15	☉
23	Tue	3:54	8.3	4:28	8.2	10:11	0.8	10:35	1.4	5:20	8:14	☉
24	Wed	4:40	8.0	5:11	8.3	10:53	1.0	11:24	1.4	5:21	8:13	☉
25	Thu	5:29	7.8	5:57	8.4	11:38	1.1			5:21	8:13	☉
26	Fri	6:22	7.6	6:45	8.5	12:16	1.3	12:27	1.2	5:22	8:12	☉
27	Sat	7:19	7.6	7:38	8.8	1:11	1.1	1:20	1.2	5:23	8:11	☉
28	Sun	8:17	7.7	8:32	9.2	2:09	0.8	2:15	1.1	5:25	8:09	☉
29	Mon	9:14	8.0	9:25	9.6	3:05	0.3	3:10	0.8	5:26	8:08	☉

