



Appledore Island, Isle of Shoals, Kittery, Maine

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Shoals Marine Laboratory
Shark Biology and Conservation (BIOSM 4650/MEFB 741)
July 11 – 25, 2022

Course Syllabus and Schedule

Faculty: Dr. Heather Marshall (hmmarshall@gmail.com)
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Teaching Assistant: Elizabeth Whitson (elizabeth.whitson@rsmas.miami.edu)

Credit hours: 3 (Cornell credits) and 4 (UNH credits)

Course Objectives/Goals:

The last 30 years have produced an explosion of new information on the biology of the approximately 1,000 living species of sharks, skates, rays, and chimaeras, which collectively make up the group Chondrichthyes. This course will cover advanced topics in the evolution, diversity, anatomy, functional morphology, physiology, sensory systems, behavior, reproduction, development, and conservation of cartilaginous fishes.

Learning outcomes for *Shark Biology and Conservation* include:

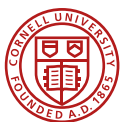
- Understanding of elasmobranch phylogeny and evolution.
- Knowledge of how evolution has resulted in a wide variety of elasmobranch anatomical, physiological and morphological specializations.
- Develop a working knowledge of the research methods used to advance understanding of shark biology, ecology and conservation.
- Understanding of shark research, objectives and study species in the Gulf of Maine.

Course Materials:

1. Background readings and research literature will be provided for students electronically.
2. Laboratory notebook (each student must provide their own, separate from lecture notebook).
3. Personal laptops (recommended each student bring their own).

Assignments & Grading:

Quizzes & Exams: Seven quizzes and one cumulative exam will be given. Quizzes are based on previous-day lectures, and all material presented in the course will be included on the exam.



Cornell University



University of
New Hampshire

Field/Laboratory Work & Research Project: Field and laboratory sessions will be based on topics covered in lecture, will explore some topics in depth, and hone your skills in reading and critically evaluating scientific literature. Students will record observations and findings in a laboratory notebook, which will be graded at the end of the course. You also will conduct a research project, which will culminate in a final presentation; we will explain more about this in class.

Participation: Success at Shoals requires a positive attitude and a willingness to accept changes in the schedule with grace. Island living demands respect for your fellow classmates, and residents on Appledore. Students are expected to actively participate in all facets of this course, and to display good citizenship while at Shoals. Part of your grade will be based on the faculty's subjective evaluation of your personal involvement in course activities. If you have any questions or comments about the course, please contact the instructors directly. Part of your grade will also be based on an art workshop and participation in that workshop.

Grading:

Quizzes	25%
Final Exam	30%
Final Project/Presentation	30%
Art Project	5%
Participation/lab notebook	10%

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 *Appledore Island Handbook* (<http://www.shoalsmarinelaboratory.org/about-appledore>)

1. *Personal Technology.* Do not use cell phones or similar devices in the classroom or during course activities. If you take notes with your computer or tablet, disable wireless access during lecture.
2. *Computer Facilities.* The lab has a few desktop computers in the Loughton 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.
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 Policies for Academic Integrity, Honesty, and Plagiarism:
 - i. Cornell and high school students: <http://cuinfo.cornell.edu/aic.cfm>
 - ii. UNH: <https://www.unh.edu/student-life/academic-honesty-policy>
5. *Disabilities & ADA Accommodation:* As Appledore Island is a remote location and any special arrangements need time and planning in order to be enacted, Shoals Marine Laboratory appreciates early notification for accommodation requests.

Students with disabilities requesting accommodations must contact the appropriate disabilities services office:

- i. Cornell and high school students: <https://sds.cornell.edu/forms>
 - ii. UNH and all other college students: <https://www.unh.edu/studentaccessibility>
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 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.

Tentative Daily Schedule:

Note: Daily Schedule is subject to change based on weather, boat availability, tides, instructor's discretion, etc.

Unless otherwise indicated, lecture is in Hamilton downstairs, and lab is in PK North

NOTE ABOUT MEAL TIMES: Food collection times are:

Breakfast: 7am – 8am

Lunch: 12:30pm – 1:30pm

Dinner: 6pm-7pm

**Sunday mealtimes differ, see schedule*

Wednesday and Saturday nights we will be helping to clean up after dinner.

WEEK 1

Monday July 11th

1:30pm – Check-in at the SML dock in Portsmouth, NH

2:30pm – Depart Portsmouth

4:00pm – Arrive at SML on Appledore Island

4:00-5:00pm – Welcome & Orientation, “Fire & Water” talk with SML Staff, tour

5:00- 5:45 – Unpack and settle into dorm rooms

6:00-7:00pm – Dinner

7:15-8:00pm – Brief introductions, student introductions, orientation/Canvas

8:00 – **Activity**

Tuesday, July 12th

7:00-8:00am – Breakfast

8:00-8:30am – Free time

8:30-9:30 am – Syllabus review/Canvas & Article 1 assignment

9:45-11:00am – Lecture 1. Classification and intro to Phylogeny

11:15-12:05am – Lecture 2. Phylogeny / **intro to seals?**

12:30-1:30pm – Lunch

1:30-3:00pm – Lab 1. External anatomy lecture, species ID **Lab in PK South

3:30pm – Seal Survey! Meet at docks.

4:30-5:45pm – Scientific method, and project introduction/assignment

6:00-7:00pm – Dinner

8:00 – Rock Talk! Dr. Catherine Mattase

Wednesday, July 13th

7:00-8:00am – Breakfast

8:00-8:30am – Study/review

8:30-9:00am – Quiz 1 -

9:15-10:15am – Lecture 3. Reproduction

10:30-12:15am – Lecture 4. Research Methods: How do we find sharks? Safety talk / **Expected Species**

12:30-1:30pm – Lunch

1:30-4:00pm – Lab 2. Rod & Reel Demo/Fishing Preparations ... **CHUM making?!**

4:00pm – Food Run!

6:00-7:00pm – Dinner

7:00-8:00pm – Article #1 discussion Assign article #2

Thursday, July 14th (1/2 fishing day)

7:15-8:00am – Breakfast
8:00-8:30am – Study/review
8:30-9:00am – Quiz 2 –
9:15am – 10:15am - Lecture 5. Comparative Form & Function
10:30am-11:30am – Lecture 6. Sensory system
12:30pm-1:30pm - Lunch
1:30pm – 5:30pm – Fishing!
6:00-7:00pm – Dinner

Friday, July 15th

7:00-8:00am – Breakfast
8:00-8:30am – Study/review
8:30-9:00am – Quiz 3 –
9:15-10:30am – Lecture 7. Stress Physiology
10:45 – 12:00pm: Lecture 8: Feeding Morphology
12:30-1:30pm – Lunch
1:30 – 3:30 – Lab 3. Dissection – Internal Anatomy lecture and dissection ... **CHUM making?!**
4:00 – 5:30 – Artist in Residence Workshop (Maggie/Heather/Liz Shark Tagging Rehearsal)
6:00-7:00pm – Dinner
7:00-8:00pm – Article #1 discussion Assign article #2

Saturday, July 16th BIG FISHING DAY

5:00am - Head out for fishing! (Return TBD)
5:45-6:30pm – Dinner
7:00 - end – blood Processing, sample processing from field work

Sunday, July 17th OUTLINE DUE, START PROJECTS

9:00-10:00am – Help to tidy up your dorm room and shared dorm spaces! ☺
10:00-11:00am – Brunch
11:15am –11:45am – Quiz 4 –
11:20-12:30pm – Lecture 9: Predatory Behavior/ Food-web dynamics
12:45-3:30 – Lab 4. Presentation on presentations/Conservation online review, design conservation outreach project
3:45 – 4:45pm - Conservation outreach project presentations... **CHUM making?!**
5:00-6:00pm – Dinner
7:30-8:30 - Commons – Project planning

WEEK 2

Monday, July 18th – Half Fishing Day

7:00-8:00am – Breakfast
8:30-9:00am – Quiz 5 –
9:15-10:15am – Lecture 10: Liz Research
10:30-11:30am – Lecture 11. Migration
12:30-1:30pm – Lunch
1:30-5:30pm – Fishing!
6:00-7:00pm – Dinner

7:15-8:00pm – Article #2 Discussion, Assign Article #3

Tuesday, July 19th

7:00-8:00am – Breakfast

8:00-8:30am – Study for Quiz

8:30-9:00am – Quiz 6 –

9:15-10:15am – Lecture 12. Biotelemetry and Metabolism

10:30 -11:30 – Lecture 13. High-performance sharks, shark hearts

11:45 – 12:15pm – Lecture 14. Start Osmoregulation

12:30-1:30pm – Lunch

1:45 – 2:30pm – Finish Osmoregulation

2:30-4:00 – Lab 5: Scientific Communication

6:00-7:00pm – Dinner

8:00pm – Rock Talk! Antoinette Clemetson

Wednesday, July 20th

7:00-8:00am – Breakfast

8:00-8:30am – Study for Quiz

8:30-9:00am – Quiz 7 –

9:15-10:15am – Lecture 15. Shark fisheries/Conservation Challenges

10:30 -11:30 – Lecture 16. Conservation Lecture

12:30-1:30pm – Lunch

1:30-2:30 – Lecture 17. Age & Growth

2:30- 5:30 – Work on those projects!

4:00pm – Food Run!

6:00-7:00pm – Dinner

7:15-8:00pm – Article #3 Discussion

Thursday, July 21st – BIG FISHING DAY

5:00am - Head out for fishing! (Return TBD)

5:45-6:30pm – Dinner

7:00 - end – blood Processing, sample processing from field work

Friday, July 22nd –

7:15-8:00am – Breakfast

9:30 – 11:00 – Shark research as a career

12:15-1:00pm – Lunch

1:30-4:00pm – Project time/study for final

5:00-6:00pm – Art Show!

6:00-7:00pm – Dinner

6:45pm – Article #3 Discussion

Saturday, July 23rd – Start thinking about packing!

7:00-8:00am – Breakfast

8:00-8:30am –

8:30-9:00am –

9:30am – Prep for presentations

12:30-1:30pm – Lunch

1:30-3:30pm – Presentations

4:00-5:30pm – Course Evaluations/Career talk (cont.)

6:00-7:00pm – Dinner

Sunday, July 24th

9:00-10:00am – Help to tidy up your dorm room and shared dorm spaces! ☺

10:00-11:00am – Brunch

11:30-2:30pm - Cumulative final exam – in classroom

Potential Talk by Megan Winton (AWSC)

5:00-6:30pm – Dinner

6:30 –Clean up/wrap up (PK)

8:00 – JAWS!

Monday, July 25th

7:15-8:00am – Breakfast

8:00-8:30am – Have luggage packed and waiting on dorm porch for pick-up by 8:30

9:15-9:30 – Gather at SML dock for departure

9:45am – Depart Appledore Island for Portsmouth, NH

10:30-11:00am – Arrive back in Portsmouth