



Fall 2021

MSCI 573: Biology of Sharks (3 credit hours)

Instructor: Daniel C. Abel
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Office Hours: TBD

Webpage: Moodle course management system.

Text: Handouts (excerpts from my forthcoming *Bio of Sharks* book)
The following book is recommended:
Ebert, D.A., 2015. *A pocket guide to sharks of the world* (Vol. 12). Princeton University Press.

*****Note***:** Shark Research and Training Cruises are an integral part of this course, and you must participate in at least 7 cruises. Cruises leave from Georgetown, SC and are scheduled according to tides and tidal currents and thus do not fit comfortably within the scheduled lab times. There will be some weekend options, but you should plan on participating in at least 3 cruises scheduled for M – F. Vans will be provided for all but weekend and Friday cruises.

Description: (Prereq: permission of instructor) (Coreq: MSCI 573L) An introduction to the biology of sharks. Lecture component covers evolution, anatomy, behavior, natural history, physiology, conservation, and ecology. Classes will be held on campus and/or in the Bahamas. FA, SU.

Objectives: This course is a comprehensive introduction to the biology of sharks. It will provide both classroom and field experience, and may include an international component. Students will learn how sharks function and what their roles are in marine ecosystems. Students will also learn methods of studying sharks both in the lab and in the field. Additionally students will learn about the conservation status of sharks as well as the effectiveness of management measures. In addition to the above, there will be extensive readings from the classic and recent literature on the biology of sharks, both related to topics covered in this course and those not covered. Students enrolled in MSCI 573 will write a review paper on a topic in shark biology.

Academic Integrity/Cheating : “Coastal Carolina University is an academic community that expects the highest standards of honesty, integrity and personal responsibility. Members of this community are accountable for their actions and are committed to creating an atmosphere of mutual respect and trust.” Violations of the Student Code of Conduct (including but not limited to academic dishonesty – cheating and plagiarism) will not be tolerated and may result in removal from the course and a grade of FX. Any such

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violations will be dealt with in strict accordance with Coastal Carolina University guidelines. FX grades cannot be removed through the Repeat Forgiveness Policy. For information on the Code of Student Conduct, please see your Student Handbook or <http://www.coastal.edu/conduct/documents/codeofconduct.pdf>.

The Americans with Disabilities Act (ADA): The ADA indicates "title II and title III entities must permit service animals to accompany people with disabilities in all areas where members of the public are allowed to go." As such, service animals are permitted in lab settings at Coastal Carolina University. Emotional support animals are not permitted in lab settings unless it is approved as a classroom accommodation. Students with service animals are strongly encouraged, but not required, to inform lab instructors of the use of a service animal. This communication provides both the student and the instructor with an opportunity to discuss and plan for the safety of the service animal as well as any other safety concerns. Students and instructors should contact Accessibility & Disability Services (843-349-2503 or <https://www.coastal.edu/disabilityservices/>) regarding any potential accommodations or for support and assistance.







If any student has a condition that impairs their ability to perform in this class, please inform me at the first class meeting.

Student Learning Outcomes:




Upon successful completion of this course, a student will be able to:

-  List the major text references in the field of shark biology
-  Identify the American Elasmobranch Association and use its website
-  List and evaluate some of the roles sharks have played and continue to play in the human experience, including literature, fine arts, music, and history
-  Define what a shark is and list characteristics that unite sharks and distinguish sharks from other major groups of fishes
-  State how many different kinds of sharks exist
-  Explain basic shark classification


Shark Diversity and Evolution

-  Classify sharks and their relatives and list distinguishing characteristics of the major taxonomic groups
-  Define the basic terminology of cladistics
-  Interpret cladograms of shark relationships based on general morphological features
-  Demonstrate an understanding of the 450 million-year evolutionary history of sharks based on the fossil record
-  Construct a dichotomous key to selected sharks and rays
-  Identify 50 species of sharks

Shark Ecology

-  List and discuss the ecological roles sharks play
-  Read, analyze, and discuss important papers on shark ecology from the literature, especially on population dynamics, trophic relationships, habitat selection, and effects of human impact
-  List the goals and methods of the CCU shark project, and analyze and discuss results

Shark Behavior, Anatomy, and Physiology

-  Identify the basic internal and external anatomy of sharks

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- Read, analyze, and discuss important papers from the literature on shark behavior
- Explain courtship, mating, and aggressive behaviors of sharks
- List and explain the basic functions of the respiratory, cardiovascular, osmoregulatory, sensory, reproductive, and digestive systems of sharks

Shark Fisheries and Conservation

- Summarize and discuss the locations, species, and environmental impacts of historical and current shark fisheries
- Define and discuss the roles in regulation shark fisheries of: the Magnusan-Stevens Fishery Conservation Act, the National Marine Fisheries Service Highly Migratory Fishes Division, and Project COASTSPAN
- Discuss the concepts of Essential Fish Habitat and primary and secondary nursery grounds
- List and discuss ways to effectively manage shark populations
- Read, analyze, and discuss important and controversial papers on shark management and conservation

Research Methods in Shark Biology

- Read, analyze, and discuss papers from the literature in order to survey methods used in shark biology
- Participate in all aspects of the CCU shark research project, including, understanding goals, designing protocols, preparing sampling equipment, collecting data, analyzing data, and writing reports
- Participate in the Bimini Biological Field Station Shark Ecology project, including collecting and analyzing data, and reading and discussing publications

Lab and Field Experience

- Conduct basic lab and field techniques, including critical thinking, technical writing, oral presentation, handling live sharks, longlining, gill netting, snorkeling, and collecting and recording data under harsh conditions.
- Swim with actively feeding sharks in order to observe general and feeding behavior
- Set and retrieve baited hand longlines
- List different tagging methods (including telemetry tracking), and tag live sharks using some of these methods
- Actively participate in field trips to Winyah Bay, North Inlet, Murrells Inlet, Port Royal Sound, and/or several sites in Bimini Bahamas in order to observe and handle sharks and understand shark ecology
- Identify basics about the captive biology of sharks, including capture and maintenance in captivity

Overall:

- Investigate, analyze, interpret, and report on the concepts above using critical thinking, visual and quantitative skills, library and web resources, and effective writing.

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Grading Policy:	Grades are assigned as follows:	
	Lecture:	
	Lecture Tests (3 @ 20 pts ea)	60 points
	Assignments	5
	Research Paper	15
	Final Exam	20
	Lab:	
	Assignments	20 points
	Participation	40
	Final practical	40
Grade Scale: >90 = A; 85 – 89 =B+; 80-84 = B; 75 – 79 = C+; 70 – 74 = C; 65 – 69 = D+; 60 -64 = D; <60 = F		

*******IN ORDER TO MAKE A C OR BETTER IN THIS CLASS, YOU MUST HAVE AN OVERALL AVERAGE >70% AND MAKE A GRADE OF 65 OR HIGHER ON THE FINAL EXAM.*******

Attendance Policy: According to CCU policy, “An instructor is permitted to impose a penalty, including the grade of F, for unexcused absences in excess of 25% of the regularly scheduled class meetings.” At my discretion, I will offer limited make-up opportunities for missed tests, provided **(a) the absence is excused (based on university policy) and, (b) you provide me with written verification of the nature of your absence in a timely manner.**

This policy also contains the following:

Students’ Responsibilities – enrollment in a course obligates the student not only to prompt completion of all work assigned, but also to punctual and regular attendance, and to participation in whatever class discussion may occur. It is the student’s responsibility to stay informed of all assignments, due dates and exams. Absences, whether excused or unexcused, do not absolve the student from this responsibility.

Missed Coursework – absences, excused or unexcused, do not absolve students from the responsibility of completing all assigned work promptly. Students who miss assignments, announced quizzes or other coursework due to excused absences will be allowed to make up the work in a manner deemed appropriate by the instructor (as stated in the course syllabus). It will be the responsibility of the student to contact the instructor and make arrangements at the convenience of the instructor. The instructor is not obligated to allow a student to make up work missed due to an unexcused absence.

IF YOU MISS A CLASS, YOU ARE SOLELY RESPONSIBLE FOR OBTAINING NOTES AND HOMEWORK ASSIGNMENTS FROM ANOTHER CLASS MEMBER (AND NOT ME).

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Classroom Policies:

My Philosophy and Approach:

My approach to teaching favors active learning and critical thinking over passive learning; promotes depth of understanding and insight over simple surveys of material; and allows students to experience what scientists actually do (e.g. observe, investigate, analyze, evaluate, discover) early in their college educations.

I believe that students in science classes should understand the nature of science, how science differs from other ways of knowing, and how science fits into society. Absent these, students are left with the mistaken impression that science is only jargon and poorly-connected factual information.

My Job:

My responsibility to you (and to society as well) is to provide a well-planned, rigorous course that enables you to fulfill the course's objectives.

Your Job:

Your responsibility is, quite simply, to assume responsibility for your education in this course. Specifically, this means

- being serious about learning * being prepared for class (**which means completing the reading and other assignments before coming to class**) * being engaged in class * **finding out what you missed if you miss a class**

You should plan on studying 2 – 3 hours per hour of class. If your preparation is less than this, then you will learn less and likely receive a lower grade.

A Few Words About Active Learning and the Class Schedule:

This course will be well-planned and organized. However, this does not mean that I will lecture to you every period and that you will passively act as a stenographer and take notes. Certainly, there will be "typical" lectures, perhaps even the majority of the time. But active learning, a proven educational technique to which I am committed, requires that you actively participate in the process.

When active learning techniques are used, the result is a vibrant learning atmosphere. There is one caveat, however. Classes where active learning is employed are conducted more like an improvisational jazz band than a fact-based, authority-delivered lecture. In-class discussions may meander and cross academic discipline lines. The upshot of this is it is difficult to stick to a syllabus where each topic is specifically assigned its own date. Hence, the topics in your syllabus are more or less sequentially correct, but there is no exact date beside each one. I will make certain that we are making adequate progress on the syllabus and that we are appropriately coordinated with the lab. The only items which are dated are exams. If you're troubled by a class where the instructor expects you to be actively involved and where the presentation is sometimes non-traditional, then by all means stop by and let's chat.

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**Additional Responsibilities
for Graduate Section**

Students enrolled in the graduate section of this course and lab (i.e., MSCI 573/573L) will have additional responsibilities. First, there is the overall expectation of additional, more rigorous work and a higher level of performance. Students will either take more rigorous tests or different tests than students in MSCI 473. Additionally, they will write a research paper counting 15% of their final grade (details provided to students separately). For lab, students will participate in 7research/training cruises (students in MSCU 473L participate in only 3-5), and the homework assignments will include additional work.

Schedule of Lecture Topics:

Introduction to Class, Cruises
Introduction to Shark Research at CCU
Introduction to Sharks & Rays
Introduction to Shark Ecology
Shark Diversity Pt. 1 Taxonomy and Systematics
Evolution & Shark Diversity Pt. 2
Shark Diversity Pt. 3
Shark Diversity Pt. 4
Reproduction Pt. 1
Reproduction Pt. 2

Physiology Pt. 1 - Osmoregulation
Physiology Pt. 2 – Respiration and Metabolism
Physiology Pt. 3 – Temperature
Physiology Pt. 4 – Heart Function
Physiology Pt. 5 – Senses
Elasmobranch Fisheries and Conservation Pt. 1
Elasmobranch Fisheries and Conservation Pt. 2
Biomedicine

Tentative Test Dates:

Test 1: Wednesday, Sept. 25
Test 2: Wednesday, Oct. 23

Test 3: Monday, Nov. 18
FINAL EXAM: Friday, Dec. 13, 1600

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