CAS BI 500: Shark Biology & Conservation

Prereq: Some background in ecology, behavior and/or evolution recommended. Together with Ichthyology (BI531), which is taught in the Marine Semester, this course helps provide a comprehensive introduction to living fishes.

Instructor Name: Prof. Phillip Lobel
Office Location: BRB 3rd floor

Contact Information: plobel@bu.edu
Office Hours: following class and by appt.

Course Dates: Jan 19 to May 3, 2023
Course Time & Location: 9 to 10:30
BRB Basement classroom
Course Credits: 4

Course description

This course explores the natural history and behavior of sharks and their relationship to Humans. Conservation of sharks and other elasmobranchs is crucial to ecosystem function and requires accurate scientific knowledge of species in order to implement the best management practices. This course begins with a phylogenetic review of the Chondrichthyan fishes. Taxonomic definition of a species and the clarity of its description is a fundamental requirement for accurate biological science and the application of conservation laws. Renewed taxonomic examination (using molecular tools) of wide-ranging species, once thought to be "circum-global", has shown that they consist of species complexes which has conservation implications. This course will delve in detail into the life, natural history, behavior and psychology of one of the best-known wide-ranging species, the Pacific Grey Reef Shark (*Carcharhinus amblyrhynchos*). We will also examine elasmobranch ecotourism case studies from Palau, Tahiti, Fiji and Belize. In class, you will be able to handle a variety of shark specimens, tracking technologies, anti-shark shield, photography gear and other devices used to study big wild animals in the open sea. The class will discuss how "shark" research has been done and what research is needed next. This course will examine the public's view of sharks, safety issues and portrayal in the media. We will include discussions and examples on how to communicate fish natural history using videos and photos, both of which will be used extensively in lectures.

Textbooks and Scientific papers

Scientific papers and lecture notes will be made available to the students on BU's BlackBoard.

Other readings

Emperors of the Deep, Sharks--The Ocean's Most Mysterious, Most Misunderstood, and Most Important Guardians, By William McKeever (copy will be given to students, a gift from the author)

Grading:

- Midterm Exam 30%;
- Final Project 20%;
- Video critiques and class assignments 30% - *requires class attendance to see some videos*
  - Includes review of McKeever book
- Dissection lab 10%;
  - The dissection labs will take place during the lecture periods with your specimen remaining available for independent study during the week.
- Participation and discussions* 10%.
  - *Class etiquette, attendance & participation, clean laboratory hygiene required
  - **Academic Conduct Code:** *https://www.bu.edu/academics/policies/academic-conduct-code/*

Class starts promptly at 9am on Tuesday and Thursday, Spring 2023

A few media references online

Shark Stories: get to know the Professor,

- Lobel shark project in Palau featured on National Geographic TV

https://www.nationalgeographic.org/media/crittercam-grey-reef-shark/

Listen to the radio comedy talk show "You're the Expert" interview talk (2014)

https://soundcloud.com/youre-the-expert/s2ep2-fish-noises

- Talk show "You're the Expert" spotlight article

https://theexpertshow.com/blog/2014/3/25/expert-spotlight

Lecture Schedule:
Tuesday & Thursday class schedule –
Example daily schedule:

1. 9am lecture starts **promptly at 9am** – intro video for critique
2. 9:50am – break for show and tell – class demos specimens
3. 10am resume lecture
4. 1030am discussion and class cleanup
5. 1045am end

The course has two long lectures per week; 9am to 1045am. This gives us time to mix lecture with "lab" to examine specimens and artifacts. Our big "lab project" is the dissection of a shark. We have two kinds of sharks to dissect, a requiem shark and a dogfish. Typically, we do this in one week during our tues-thur lecture times. Students can arrange independent time to continue detailed dissection if they so desire. Our other labs will mainly be examining specimens, underwater photography/video gear and examples of technology used to study elasmobranchs. These will be on display during lectures. We will have 'daily videos' to be show in class which requires students to watch and enter their reviews into Blackboard.

This course is a mix of "scientific lectures" and discussions about how "sharks" impact human lives. More than other fishes, sharks and other elasmobranchs are the 'big-ticket items' in ecotourism, both positively (divers watching tropical sharks) and negatively (Cape Cod beaches). We will use our scientific perspective to evaluate aspects of "sharks and society". We will study the practices of conservation and ecotourism using a few specific case studies including Belize whale sharks, Pacific Grey Reef sharks, Reef Whitetip sharks (with focus on Cocos Island). We will also examine the issue of how Great White Sharks are impacting Cape Cod. Class presentations will include extensive use of videos and photos. Sharks more than most species have been the subject of much media attention and we will discuss facts and fantasies.

There will be one exam covering anatomy and phylogeny. The big course project is a combined paper and lecture (powerpoint) on a topic about elasmobranchs (to be determined in class with a proposal) and will be due the last week of class. The dissection requires a worksheet to be completed and submitted. There will be daily videos in lecture that students will critique using Blackboards's assignment feature.

Please note that all lectures are live and *will not* be posted online. Course lecture notes, readings and supporting materials will be posted on Blackboard. Videos that are shown from youtube will have website address posted. HOWEVER many of the videos I will show are not published and have copyright such that I cannot post them, we will watch these live in class as part of our academic lecture. But if you miss class, you will miss that daily assignment.

Be prepared to take notes in class

Lecture slides will be posted for review but without all photos or videos etc due to files sizes or copyrights. Pay attention **and take notes in class** because not all facts or discussion will be captured in the lecture notes.

Schedule will most likely evolve as the course progresses

class number	Tuesday-Thursday	class topic
	Jan	
1	19	Intro to class, intro to shark research in the Lobel Lab- ***topics for student's papers***
2	24	Sharks and humans: **ecostourism** & conservation, ***more about*** student **final course project!**
3	26	Preparatory dissection lecture - shark parts etc- organize all preps, lab orientation & safety
4	31	Dissection dogfish/ sand shark: external & internal anatomy: organ systems; Using dichotomous keys for specimen identification
5	**Feb 2**	shark brain dissection , shark teeth morphology , jaws, embryos,- brain
6	7	Chondrichthyans through time, Paleozoic, Mesozoic and Cenozoic to now
7	9	Phylogeny of living Chondrichthyans; key morphological features
8	14	Phylogeny of living Chondrichthyan CONTINUED
9	16	Shark sensory capabilities: electric & vision
10	**Holiday Feb 21**	**holiday no class on Tuesday Feb 21 because Monday Feb 20 classes substitute**
11	23	Tonic Topor
12	28	review for test-
13	Mar 2	**EXAM -** Chondrichthyan nomenclature, morphology and taxonomic classifications
	March Vacation Mar 3 to 12	
14	14	Great white shark -current issues in Massachusetts
15	16	shark attacks, tracking technologies, defensive technologies
16	21	Grey Reef shark behavior and ecology - studies at Johnston Atoll & Palau
17	23	Grey reef sharks intimate behavior- applying acoustic telemetry technology
18	28	Cocos island of sharks , Behavior using cameras - filming natural history documentaries and its scientific contribution
19	30	Cocos island of sharks part 2
20	**Apr 4**	Whitetip sharks and shark reproduction
21	6	Whale Shark & ecotourism in Belize and worldwide
22	11	Eco-politics of shark feeding ecotourism; Fiji, Tahiti, Bahamas
23	13	Small elasmobranch Conservation (e.g. Belize stingray project)
24	18	Future directions in the relationship of humans and elasmobranchs
25	20	**Follow up from earlier lectures**
26	25	**class presentations and discussions**
27	27	**class presentations and discussions & *course evaluation***
28	May 2	**class presentations and discussions**
	May 3	**all final papers must be submitted by noon.**

SCHEDULE subject to change – check for updates on Blackboard

General Course Information and the BU HUB

Resources/Support/How to Succeed in This Course:

1. If you need help outside of regular meetings, please make an appointment with Prof Lobel.
2. Accommodations for Students with Documented Disabilities: If you are a student with a disability or believe you might have a disability that requires accommodations, please contact the Office for Disability Services (ODS) at (617) 353-3658 or access@bu.edu to coordinate any reasonable accommodation requests. ODS is located at 19 Deerfield Street on the second floor (19 Buick Street as of September 1, 2018).

Course Specific Learning Outcomes

- Students will apply principles of phylogeny to understand fish adaptations and describe what makes an elasmobranch different from other fishes
- Students will become familiar with principals of ecology and behavior and understand the basis for the conservation issues concerning tourism of sharks, skates and rays.
- Students will learn the evolutionary history and behavior of sharks, skates and rays
- Students will become familiar with shark anatomy and be able to identify the diversity of living chondrichthyans.

Training students will receive in BI 500

- How to identify a shark, skate or ray to the correct taxonomic species designation.
- How to dissect and to identify the soft anatomy of a shark.
- How to study fish behavior, life history and fish biodiversity within the conceptual context of phylogeny and evolution
- How underwater films about fish behavior and natural history are made and how these can be used in scientific studies
- Public communication of scientific information and discussion of conservation issues.
- Become familiar with a variety of sampling and tagging methods that are used to study their biology and behavior.

Hub Learning Outcomes

Scientific Inquiry II

In this course, you will to apply scientific knowledge to further understand marine systems and global shark fisheries dynamics.

- Students will dissect and analyze shark morphology and behavior. Students will demonstrate an understanding not only of your own selected species, but what it means within a larger context of shark biodiversity.

Oral and/or Signed Communication

In this course, you will participate in group discussions and oral presentations of your work. With feedback from your instructor, you will develop an understanding of delivering responsible, considered, and well-structured short talks. Additionally, you will engage in other students' presentations by asking questions and participating in discussions surrounding other's research.

- Students participate in discussions held in class. All students are expected to be able to communicate effectively the ideas presented in the assigned readings. Students are also expected to be able to answer questions from peers at the end of their final presentations.

Research and Information Literacy

As part of your research process, you will learn to search for, select, and use appropriate information sources. You will gain a deep understanding of how to answer a question through research.

- Students' conduct and original research project on an aspect of shark behavior or conservation. This can include any time of media as a final product (i.e. report, film, animation, software, web page, etc). Students will present their project to the class in a symposium-style lecture format.