

BIOLOGY OF FISHES; BIOL 335

Syllabus

Fall Semester 2020

Class meetings: Tue. & Thu. 12:15 AM - 1:30 PM. RITA 154

Laboratory 1: Mon. 1:30 PM – 4:30 PM. GMLM 101

Laboratory 2: Tue. 2:30PM. – 5:30 PM. GMLM 101

Instructor

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VALID August 18th, 2020: Due to the ongoing COVID-19 pandemic, please consider the following syllabus is valid for today's date. If the College issues changes to the calendar and/or in-person contact protocols due to COVID-19, weather related evacuations or other unforeseen reasons, I will provide you with a modified versions of this syllabus as changes occur. My goal is to ensure the learning outcomes listed below, but how and when they are finally achieved may change multiple times over the Fall 2020 semester because of factors beyond my control.

Office Hours

In my office at the Grice Marine Laboratory (room 206 – though weather permitting we will go outside of Grice) on Monday between 12:00 AM to 1:00 PM, or on Tuesday at the RITA Science Building (outside room 154) between 11:30 AM and 12:05 AM (we will seek an appropriate location to maintain social distancing), or by previous appointment through email. There are **no excuses** to not come by my office or meet me elsewhere to discuss any issues related with this course or any other topic related to fishes. My door is always open, and I expect all students to stop by to introduce yourselves at some point early in the semester, preferably in the first half! I do not bite, I love talking about fishes. Please come and talk to me EARLY on, one of the advantages of in-person instruction is getting to know each other and discuss class/career/fish related topics informally.

Course Description

This course will introduce you to various aspects of morphology, evolution, ecology, physiology, life history, behavior and conservation of fishes, as well as provide a brief survey of the structures used in identification of fish, paying special attention to the local Charleston area fauna. This will be accomplished by combining a series of class lectures and laboratory sessions, complemented with multiple field trips, practical exercises, use of dichotomous keys, specimen examinations and organized discussions. The first part of the course will cover general morphology, physiology and taxonomy, the second part stresses life histories, ecology and conservation. This course is a sustainability related course part of the Sustainability Literacy Institute (<http://sustain.cofc.edu/>). OAKS will be used for this course throughout the semester to provide the syllabus and class materials and grades for each assignment, which will be regularly posted. Face masks must be worn by all students at all times during class activities and while on CofC campus. Proper social distancing of 6 feet will be maintained at all times with all other students during class activities and when in the presence of the instructor.

Student Learning Outcomes

- Learn how to identify and recognize main taxonomic groups of fishes and their general characteristics; use of dichotomous and taxonomic keys.
- Learn to use different sources of scientific information in order to gain further knowledge about fish biology and ecology.
- Identify the various elements affecting the sustainability of fish populations today
- Identify fishery policies and practices that have led to changes in fish populations
- Appreciate the challenges of studying aquatic mobile organisms such as fishes

Transportation

Because of COVID-19 and required social distancing rules, in Fall 2020 there will be no CofC shuttle service between main campus and the Grice Marine Laboratory. Students are responsible for their own safe transportation to and from the Grice Marine Laboratory for the in-person Laboratory session and work with fish specimens.

Policies and Requirements

1. This course will be conducted strictly in accordance with the honor system of the College of Charleston (<http://www.cofc.edu/studentaffairs/HonorBoard.htm>). All work that you turn in for this course (whether for paper, exam or quiz) must be your own, and have not been utilized in any way for other course assignments (in doubt, check with me). Any form of plagiarism (intentional and unintentional), cheating, or presenting someone else's work as one's own will be treated as a serious academic transgression and will be communicated accordingly by the instructor as an honor code violation to the Division of Student Affairs. A student found responsible for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student's transcript for two years after which the student may petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board. Please remember that unauthorized collaboration --working together without permission-- is a form of cheating. Unless I specify that you can work together on an assignment and/or test, no collaboration is permitted. Other forms of cheating include possessing or using an unauthorized study aid (such as a PDA, iPhone or smart phone with class relevant data), copying from another's exam, fabricating data, plagiarizing, and giving unauthorized assistance. Remember, research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the professor. You can find the complete Honor Code in the Student Handbook at http://www.cofc.edu/studentaffairs/general_info/studenthandbook.html. Be smart, learn a lot and have fun.

2. It is strongly recommended that you attend all class and laboratory meetings (in person or synchronously online), unless you have a legitimate excuse (extreme illness or emergency), which should be communicated in advance to the instructor. Please show up on time. A word of advice, if you miss classes you will have great difficulties passing this course, I expect to cover certain materials in more depth than the textbooks do. Lectures will be recorded for those students that cannot attend class for health reasons, but laboratory sessions that are scheduled to be in person will require student attendance (if a student suffers significant health issues and has to miss one or two laboratory sessions, please contact me ahead of time to discuss possible alternatives/make up work). Laboratory exercises are due at the beginning of each laboratory session. Students who need special accommodation to fully participate in this class are encouraged to speak to me as soon as possible so I can make proper accommodations, as well as to contact the Center for Disability Services (SNAP@cofc.edu).

3. All students are expected to turn in the papers and assignments by the beginning of the class period on the dates scheduled. Late papers will be marked down one full letter grade for every day of delay (so you receive an F for an assignment that is 4 days late, but still worth turning in to avoid a grade = zero). You should hold onto electronic and Xeroxed copies of all your assignments until the final grade for the class has been turned in.

4. Do not leave the class for a break during lectures – it is distracting and rude to have classmates come and go. If you are late you are welcome to join us quietly, but please try to not be late. Cell phones off/silent and out of sight unless you are expecting a truly urgent call beforehand (please notify instructor). **NO TEXT MESSAGING DURING CLASS PLEASE!** It can wait. It is a pet peeve of mine, if you cannot spend 70 minutes paying attention and participating in a fish biology class, then why did you sign up for the class? Also, no laptops are allowed in lectures without special permission based on demonstrated need (talk to me). I have been receiving complaints from students saying typing on laptops are very distracting during lectures. Please stay awake, participate actively and be attentive. I encourage you to raise your hand or get my attention to interrupt lectures or labs at any time to ask a question.

5. I encourage everybody to come and introduce yourself early in the semester. SNAP students, athletes, active duty/reserve military students, students with health concerns, please come and chat with me right away.

6. Any student eligible for and needing accommodations because of a disability is requested to speak with the professor during the first two weeks of class or as soon as the student has been approved for services so that reasonable accommodations can be arranged. Center for Disability Services/SNAP (<http://disabilityservices.cofc.edu/>)

7. Inclement Weather, Pandemic or Substantial Interruption of Instruction. If in-person classes are suspended during the semesters, I will announce a detailed plan for a change in modality to ensure the continuity of learning. All students must have access to a computer equipped with a web camera, microphone, and Internet access. Mental & Physical Wellbeing:

8. In these strange times, everybody at the College takes every students' mental and physical wellbeing seriously. I certainly do, please be open with me if you are experiencing difficulty, so I can direct you or provide help. If you find yourself experiencing physical illnesses, please reach out to student health services (843.953.5520). And if you find yourself experiencing any mental health challenges (for example, anxiety, depression, stressful life events, sleep deprivation, and/or loneliness/homesickness) please consider contacting either the Counseling Center (professional counselors at <http://counseling.cofc.edu> or 843.953.5640 3rd Robert Scott Small Building) or the Students 4 Support (certified volunteers through texting "4support" to 839863, visit <http://counseling.cofc.edu/cct/index.php>, or meet with them in person 3rd Floor Stern Center). These services are there for you to help you cope with difficulties you may be experiencing and to maintain optimal physical and mental health.

9. Many CofC students report experiencing food and housing insecurity these strange days. If you are facing challenges in securing food (such as not being able to afford groceries or get sufficient food to eat every day) and housing (such as lacking a safe and stable place to live), please contact the Dean of Students for support (<http://studentaffairs.cofc.edu/about/salt.php>). Also, you can go to <http://studentaffairs.cofc.edu/student-food-housing-insecurity/index.php> to learn about food and housing assistance that is available to you. In addition, there are several resources on and off campus to help. You can visit the Cougar Pantry in the Stern Center (2nd

floor), a student-run food pantry that provides dry-goods and hygiene products at no charge to any student in need. Please also consider reaching to me if you are comfortable in doing so

Textbooks:

- Helfman, G.S., B.B. Collette and D.E. Facey. 2009 (or 1997 – though chapter order changes a little bit). *The Diversity of Fishes*. Blackwell Science, Inc., Malden, Massachusetts. (It is recommended, but not absolutely necessary. I really like the book, but it is not absolutely needed, and it is expensive.)

*Plus ONE of the following two **field guides** (**Absolutely need one** – or get both):*

- Robins, C.R., G.C. Ray, and J. Douglass. 1986. *A Field Guide to Atlantic Coast Fishes of North America*. The Peterson Field Guide Series, 32. Houghton-Mifflin Co., Boston. (*out of print – preferable if found used and affordable – avoid scams; be careful, some books can be poorly bound*)
- Valerie A. Kells and Kent Carpenter. 2013. *A Field Guide to Coastal Fishes: From Maine to Texas*. 1st Edition. ISBN-10: 0801898382

Supplementary readings (Pertinent questions from readings will appear in midterm and final exams, and laboratory exercises will revolve around particular readings – can be checked out of local libraries or bought used as paperbacks, both are great reads in my opinion):

- Anders Halverson. 2011. *An Entirely Synthetic Fish*. Yale University Press. Supplementary reading focused on the history of management of rainbow trout, the most commonly stocked and controversial freshwater fish in the United States.
- Samantha Weinberg. 2001. *A Fish Caught in Time: The Search for the Coelacanth*. Harper. supplementary reading chronicling the history of the discovery of Coelacanth species in the late twentieth century

Dissection Kit – The typical blue one they sell at the library works fine (scissors, tweezers, needles, etc.). Please mark/tag all you instruments and tools, or you will be misplacing them in the laboratories.

Lab Notebook: Given the amount of material covered in this course, you may find it useful to maintain a lab notebook. In this notebook, you can keep sketches, definitions, and any other notes that help you learn the material and study for exams. Any type of notebook can be used. This is not a class requirement, but merely a helpful suggestion.

Classroom activities

Lectures in class and synchronously online will provide you with base information regarding the biology of fishes, but more in-depth knowledge will be acquired through laboratory sessions and by consultation of the textbooks. The main textbook used for this class (Helfman et al. 2009) is a very extensive book and may seem “arid” at times, but is a great source of information, and it is great to consult after lectures if you do not completely understand a topic. The listed order and dates of the lectures provided at the end of this document may change as the semester progresses. Powerpoint slides used in lectures will be available through Oaks for future reference. If you become especially interested in any specific topics related to fishes after a class, please come to my office and I will be able to hand you extra complementary and in-depth materials!

It is strongly suggested that during lectures you take your own notes (in person and online). Take notes when the course becomes interesting, when it is dull and when pictures of fish are being shown (basically always take notes). Copies of most of the overheads used in the class will be made available on the web to all students before the lecture, but this is not an excuse for you not to take notes or to stop attending the classes. Under no circumstances believe that you can pass this course by just reading the Powerpoint slides, they are just a compliment to your own notes and the textbooks. If you miss a class, please contact your classmates and make a copy of their handouts, since they will have essential class notes written on them. Class sessions will be recorded via both voice and video recording. By attending and remaining in this class, the student consents to being recorded. Recorded class sessions are for instructional use only and may not be shared with anyone who is not enrolled in the class.

Laboratory activities:

- A. *Dissections.* You will need a dissecting kit, available at the College Bookstore (can also be bought elsewhere); always bring the dissection kit to the in-person laboratory sessions because, among other activities, the instruments will be needed for handling specimens while making identifications.
- B. *Study of the fish skeleton (osteology).*
- C. *Morphometrics and meristics.* Standardized measuring (morphometrics) and counting (meristics) of structures used in identification and systematic analysis.
- D. *Diversity.* Learning the fishes in the Grice Marine Laboratory reference collection.
- E. *Fish identification.* Learning to use dichotomous keys and identification of specimens collected during class field activities. You **NEED** to have one of the two required fish identification guides, bring to every laboratory section.
- F. *Field sampling techniques.* Use of different methodologies employed to capture fishes in various environments. Specific shoe wear and clothing instructions will be given before each field trip.

During laboratory sessions (and using time outside classroom) you will have **to complete the identification of a set of 40 unknown fish specimens** (you **must** identify your **own** unknowns to receive a grade) from the laboratory collection. You are to turn in by the set date a **typed list of the family, genus and species names for each jar of specimens you are assigned**. The list of identifications is to be in numerical order, according to jar number.

Field activities:

Field activities are an important component of the course, mostly taking place during laboratory sessions. We will make near-shore collections behind Grice Marine Laboratory and a trawling in Charleston harbor on board one of the SC Department of Natural Resources vessels. Please bear in mind that some flexible scheduling will be necessary in order to allow for certain field activities to occur. Specific notice of special scheduling needs will be given in advance to allow for field activity planning and logistical preparations, as well as to insure full student participation (do not miss the field trips!). If due to COVID-19 in-person activities at the College are cancelled, online replacement activities will be provided to students as an alternative.

During some field activities we will use various types of nets and traps to sample the fish species present in different aquatic habitats, while maintaining proper social distancing. We will also measure certain critical environmental parameters that might help explain the fish species found at each location. Among our goals are to (a) report the various fish species found and their

abundance, (b) describe and compare the fish faunas in various habitats, and (c) hypothesize about which factors could explain any observed differences among the sampled fish species assemblages.

Social distancing and wearing of masks will be required during these field activities, which will all depart from Grime Marine Laboratory. Proper foot protection will be needed to participate in field trips, and the instructor will turn back any students not wearing a face mask and/or proper shoe wear.

Web based research exercise

You will be required to answer a series of questions that will be given to you in advance by the instructor regarding different aspects of fish taxonomy and biology. Specific instructions will be issued with the assignment, and the necessary information to answer these questions should be obtained from www.fishbase.org, an ichthyological website that accumulates extensive information on fishes that can become a very useful tool for students. Please note that this webpage can be slow at times and has been known to crash when too many users are logged on, so please do not all wait until the last moment to do this assignment!

Research paper:

You will be required to write a paper that reviews the current published research on some specific aspect of fish biology. The topic must be focused on fishes, and may encompass any scientific field, though focus on sustainability is encouraged! Focusing on the importance fishes as food is also an option. But all paper topics must be consulted and approved by me before the deadline. The paper should be no longer than 2000 words in length (not including Literature Cited) with a **minimum** of 10 references from the **primary scientific literature**. Review articles from scientific journals or popular magazines such as *Scientific American*, *Discover*, *Endeavor*, and *Science News* **do not** represent publication of original, peer-reviewed, research and are, therefore, not part of the primary scientific literature. **You can cite some non-primary sources but you must still have at least 10 cited from the primary literature.** Follow the *Journal of Fish Biology* (Journal of the Fisheries Society of the British Isles) literature cited format exactly! Type references to the articles in the format as described in the instructions to authors from the journal *JFB* under the heading REFERENCES. Instructions to authors can be found in actual *JFB* journals or in the journal's webpage, it is your responsibility to find them, read them and follow them! Pay close attention to the format of the cited articles; the appropriateness of these references to your topic and adherence to the format will be graded.

Please prepare your paper as though it were a manuscript for publication, following formats for manuscripts of the journal *Journal of Fish Biology*. They can be found under "instructions to authors". The title should head the first page, followed by the Abstract and then the Introduction, Materials and Methods (your own methods! What did you use, where?), Results, Discussion (these two last sections can be combined into a single "*Results-Discussion*" section), Acknowledgments, References. The main differences between a published article, as seen in the published journal, and your paper are that your paper should be double-spaced (typed) in a 12 pt. font and presented in single (not double) columns. Any figures or tables you use should be numbered, captioned, referenced according to their literature source, and placed at the back of your paper, each on a separate page. See the *JFB* website, where manuscript formatting rules are presented in great detail, and consult an actual article published in *JFB*.

Submit your typed final paper properly formatted by the due date. I will accept preliminary versions of the paper **only before the specified date**, which I will correct, comment and return to

you (but not grade). The final paper will be graded as if it were a submission to a scientific journal. Content of the paper (50%) and its adherence to proper format (50%) will be graded.

Research paper oral presentation (Mini Symposium)

The results from your research paper will be publicly presented to the class during the Laboratory sessions. The format of these presentations should adhere to standard research symposium oral presentation guidelines. Time limits will be strictly enforced and presentations should be restricted to 12-15 minutes total (12 minutes maximum for presentation and 3 minutes for questions). Presentations can be supported different graphical aids, though the use of Powerpoint presentations is recommended. The content (50%) of the presentations as well as their style and clarity (50%) will be evaluated and graded. A very strong recommendation: practice your talk multiple times before the actual class presentation.

Tests/Exams

Final lab practical: It will mainly consist of the sight recognition and identification of a subset of species from the **List of Required Fishes** (106 different species). At each station you should give the family, genus, and species names, plus the accepted common name for the fish. There will also be stations dealing with general morphology and osteology of fishes. A **first lab practical** will be held so you can practice, and it will include only the first 30 species from the List of Required Fishes. If due to COVID-19 in-person laboratory activities are cancelled, and online replacement list of required fishes and final practical exam will be provided.

Mid-term test: Will include all the lecture material covered in the first half of the course (morphology, evolution, diversity and physiology of fishes), up to the last lecture before the midterm exam. This will be an in-person exam.

Final Examination: Cumulative – it will include all lecture material covered in the course, though emphasizing the lecture materials covered in second half of the course (life history, ecology, behavior and conservation of fishes). This exam will be done synchronously online on Thursday December 10th, from 1 to 3pm. A computer with video camera and proper internet connection will be required for the final exam.

Important Dates (as of August 18th, 2020):

Last day of Drop/Add for full semester classes	Aug 28
Web based exercise	Sep 10
Research project selection topic	Oct 1
Mid-term test	Oct 8
Research project paper optional draft	Oct 20
First lab practical (1-30 fishes)	Oct 26-27
Last day to withdraw with a "W"	Oct 28
Identification of 40 unknowns	Nov 2
Election Day. No Classes. VOTE!	Nov 3
Research project paper	Nov 10
Research project presentations	Nov 9-17
Final lab practical (1-106 fishes)	Nov 23-24
Thanksgiving Holiday. College closed	Nov 25-29
Final Examination (online 1-3 PM)	Dec 10

Grading:

Mid-term test	15%
Research project paper	13%
Research project presentation	4%
Final Examination	25%
Web based exercise	3%
Identification of 40 unknowns	15%
First lab practical (1-30 fishes)	4%
Final lab practical (1-106 fishes)	18%
Discussion participation	3%

Grading scale:

93-100 = A	Superb
90-92 = A-	Excellent
87-89 = B+	Very good
83-86 = B	Good
80-82 = B-	Just good
77-79 = C+	Above average
73-76 = C	Average
70-72 = C-	Below average
67-69 = D+	Acceptable
63-66 = D	Barely acceptable
62-60 = D-	Almost acceptable
<60 = F	Failing

Helpful Advice to do well in this class:

1. Attend class! Attend class! If you have medical/COVID/other issues going on, watch the recorded lessons!
2. Get involved. Ask questions (to both the instructor and your peers).
3. Don't just take notes, LISTEN, QUESTION, and LEARN during class time (active learning).
4. Rewrite your notes promptly (within 24 hours of lecture), especially if there is something you did not understand in class.
5. Keep up. Ask Questions. Search for deeper knowledge
6. Get some sleep outside of class. If you come to class and sleep, you can't expect to learn much.
7. Study to understand, not to remember. Though some remembering is required too.
8. Remember to think logically about biological concepts; you will frequently be able to reason out an answer instead of just memorizing it.
9. Come see me with your questions or concerns, I will be happy to help!
10. Fishes are cool, be sure to try to learn as much as you can about these animals... my job is to help you in doing so.

Laboratory Safety in BIOL 335:

During this class you are expected to handle fish specimens that are preserved in aqueous solutions of 50% isopropyl alcohol or 70% ethyl alcohol. Both chemicals can be potentially hazardous, and the following safety precautions must be observed by all students participating in BIOL 335 in order to insure your safety. Students dismissed from a teaching lab due to violations of the following safety procedures will not be allowed to re-enter the laboratory until authorized to do so by the instructor. Any course work missed because of a violation of these guidelines cannot be made up at another time (or by an extension of the lab period) and will be treated as an unexcused absence.

1. You are responsible for knowing the biological, chemical, electrical, ergonomic, mechanical, and physical hazards associated with the equipment and materials that are being utilized in the laboratory. Listen to all instructions and ask questions about that which you do not understand. MSDS safety sheets for 50% isopropyl alcohol and 70% ethyl alcohol are available in GML 101 and 201.
2. Know the location of safety equipment: telephones, emergency shower, eyewash, fire extinguisher, fire alarm pull.
3. Know the appropriate emergency response procedures. If there is an injury or emergency, call 953-5611.
4. Do not work alone in the laboratory if you are working with hazardous materials or equipment.
5. Do not engage in horseplay, pranks or other acts of mischief while in lab.
6. Drinking, eating, and application of cosmetics is forbidden in GML 101 and 201 when alcohol containers are open or fish are present. Smoking is forbidden in all College buildings.
7. Closed toe shoes are required in GML 101 and GML 201. The heel and top of foot must be covered. High heeled shoes, sandals, and perforated shoes are not permitted. This is to protect your feet from glass if a specimen jar is accidentally dropped.
8. Appropriate protective gloves will be available to students in GML 101 and 201 in order to handle fish that are preserved in alcohol solutions if needed. Alcohol solutions can cause upon direct contact minor skin irritations. If skin irritations are detected, please wash exposed surface with mild soap and plenty of water.
9. Protective eyewear will be available to students in GML 101 and 201 in order to protect their eyes if needed while removing and returning fish specimens to their containers, since alcohol solutions could be accidentally splashed if fish are handled incorrectly. Alcohol solutions can cause severe eye irritation and discomfort if in direct contact, and reversible and/or irreversible corneal damage may occur. If alcohol is splashed on eyes, immediately flush eyes with plenty of water for 15 minutes.
10. Treat sharps and broken glassware containers carefully. Broken glass should be disposed of in properly marked safety containers. All sharps (needles, razor blades, etc.) used for any purpose must be disposed of in specially labeled SHARPS containers.

11. Use good personal hygiene. Keep your hands and face clean. Wash hands thoroughly with soap and water after handling any chemical or biological agent.

12. Clean up the work area on completion of an operation or an experiment. Before leaving the laboratory, you are responsible for making sure your lab area is clean and organized.

13. Always have your College of Charleston identification and insurance information with you when working in a laboratory or in the field. MedicAlert identification must be worn if you have any potential life-threatening chemical sensitivities or medical conditions.

14- Appropriate clothing must be worn during field trips. The instructor will determine and inform the students ahead of time of what specific clothing and protective gear must be worn for each individual field trip, depending on the environment or gear being used. Proper foot protection will be needed to participate in field trips, and the instructor will turn back any students not wearing proper shoe wear.

15. Report any accident or injury, however minor, to your instructor or lab manager immediately. An accident report form must be completed and forwarded to the department chair, dean, and to the Director of Environmental Health and Safety

COURSE OUTLINE

Date	LECTURE TOPIC	Readings ¹
August		
Tu 25 online	Course Introduction.	
Th 27 online	History of Ichthyology	1
September		
Tu 1 online	General Morphology; Skeleton, Skin and Scales	1, 3
Th 3 online	Systematics and Evolution.	2, 11
Tu 8 online	Diversity of Fishes I	11, 12, 13, 14, 15
Th 10 online	Diversity of Fishes II WEB BASED EXERCISE DUE	
Tu 15	Diversity of Fishes III	11, 12, 13, 14, 15
Th 17	Diversity of Fishes IV	11, 12, 13, 14, 15
Tu 22	Soft Anatomy	4
Th 24	Respiration, Circulation and Metabolism	5
Tu 29	Homeostasis	7
October		
Th 1	Sensory Perception I RESEARCH PAPER TOPIC SELECTION	6
Tu 6	Sensory Perception II	6
Th 8	MID-TERM TEST	
Tu 13	Swimming and Locomotion	8
Th 15	Reproduction I	20
Tu 20	Reproduction II RESEARCH PAPER OPTIONAL DRAFT DUE	20
Th 22	Early Life History	9
Tu 27	Age and Growth	10
Th 29	Feeding. Fishes as predators and prey I	8, 18, 19
November		
Tu 3	Election Day (No Classes) VOTE!	
Th 5	Feeding. Fishes as predators and prey II	8, 18, 19
Tu 10	Schooling and Migration I RESEARCH PAPER DUE	21, 22
Th 12	Schooling and Migration II	21, 22
Tu 17	Fisheries and Fish I	25
Th 19	Fisheries and Fish II	25
Tu 24	Conservation and Fisheries I	25
Th 26	Thanksgiving Break (No Classes)	
December		
Tu 1 online	Conservation and Fisheries II	25
Th 3 online	Conservation and Fisheries III– Final Exam Review	25
Th 10 online	FINAL EXAM (cumulative - online) (1-3 PM)	

Specified Readings¹ are chapters in the text by Helfman et al..

Date	LABORATORY 1	
August		
Mo 31 online	End of the Line Movie – Fish as Food ZOOM Discussion	
September		
Mo 7 online	Artifishal Movie – Wild Fish ZOOM Discussion	
Mo 14	Fish Osteology and Morphometrics. Fish identification Introduction	
Mo 21	Fish Dissection. Introduction to 106 Fish Collection	
Mo 28	Grice Cove Seining <i>Field Trip</i>	1PM Low
October		
Mo 5	Charleston Harbor Trawling <i>Field Trip</i>	
Mo 12	Fish Meristics and More Fish Identification	
Mo 19	Grice Cove Seining <i>Field Trip 2</i>	5PM Low
Mo 26	FIRST LAB PRACTICAL EXAM (first 30 fishes only)	
November		
Mo 2	IDENTIFICATION OF 40 UNKNOWN DUE	
Mo 9	RESEARCH PAPER PRESENTATIONS + Fisheries Discussion / Fish as Food II	
Mo 16	RESEARCH PAPER PRESENTATIONS + Lab Practical Exam preparation	
Mo 23	FINAL LAB PRACTICAL (all 106 required fishes, osteology, external morphology)	
Mo 30 online	Final Lab ZOOM Discussion – Coelacanths and Completely Artificial Fishes	

Always bring your fish ID Book and dissection Kit to Laboratory. Please be prepared for the field trips, bringing the appropriate clothing and shoe ware (you very likely will get wet).

Date	LABORATORY 2	
August		
Tu 25 online	NO LAB	
Tu 1 online	End of the Line Movie – Fish as Food ZOOM Discussion	
September		
Tu 8 online	Artifishal Movie – Wild Fish ZOOM Discussion	
Tu 15	Fish Osteology and Morphometrics. Fish identification Introduction	
Tu 22	Fish Dissection. Introduction to 106 Fish Collection	
Tu 29	Charleston Harbor Trawling Cruise <i>Field Trip</i>	
October		
Tu 6	Charleston Harbor Trawling <i>Field Trip</i>	
Tu 13	Fish Meristics and More Fish Identification	
Tu 20	Grice Cove Seining <i>Field Trip 2</i>	
Tu 27	FIRST LAB PRACTICAL EXAM (first 30 fishes only)	
November		
Tu 3	Election Day (No Classes) VOTE! Turn IDENTIFICATION of 40 UNKNOWNNS Electronically on November 2nd	
Tu 10	RESEARCH PAPER PRESENTATIONS + Fisheries Discussion / Fish as Food II	
Tu 17	RESEARCH PAPER PRESENTATIONS + Lab Practical Exam preparation	
Tu 24	FINAL LAB PRACTICAL (all 106 required fishes, osteology, external morphology)	
Tu 1 online	Final Lab ZOOM Discussion – Coelacanth and Completely Artificial Fishes	

Always bring your fish ID Book and dissection Kit to Laboratory. Please be prepared for the field trips, bringing the appropriate clothing and shoe ware (you very likely will get wet).