

**BIOLOGY OF FISHES; BIOL 335**  
**Syllabus**  
**Spring Semester 2016**

**Class schedule and locations**

Lecture: Monday 2:00 – 5:00 PM, Grice Marine Laboratory room 101/201

Laboratory: Thursday 2:00 – 5:00 PM, Grice Marine Laboratory room 101/201

**Instructor**

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Office hours and location: GML Rm. 119. Mail boxes located in GML 102. Office hours: Mon 9:00 – 11:00, or by appointment in GML 119.

**Course Description**

A brief survey of gross morphology with emphasis on the structures used in identification and more detailed considerations of some of the aspects of evolution, ecology, physiology, life history, and behavior.

**Course Objectives**

Define, describe, and explain the following terms as they relate to fishes: speciation, phylogeny, life history, biogeography, ecology, osmoregulation, reproductive mode, biodiversity.

Recognition of an array of fish species, with emphasis on those of the immediate region, and knowledge of the families and higher categories of classification to which they belong.

Develop knowledge of the skeleton and other anatomical components and their functions.

## **Policies and Requirements**

**1. This course will be conducted in accord with the honor system.** In particular, unauthorized collaboration on an assignment, including your fish identification lab project (identification of 40 unknowns), is a violation of the Honor Code.

**2. Attendance Policy:** You are expected to attend all meetings of the class. Documentation for absence is only required in this course if you are absent for a test/exam or are missing an assignment due date. More than five unexcused absences will result in a grade of WA for the course.

Students reporting an absence should go to the office of the Associate Dean of Students located at 67 George Street (white house next to Stern Center) to discuss absences and fill out the appropriate forms. The forms are also available online at: [http://www.cofc.edu/studentaffairs/general\\_info/absence](http://www.cofc.edu/studentaffairs/general_info/absence) and can also be faxed to their office at 953-2290.

**3. Electronic Devices:** The use of cell phones, especially texting, during class is a distraction to instructors and to other students; to be fair to all those concerned they must not be in use while class is in session. Consequently, all electronic communications devices (e.g., cell phones, laptop computers) must be turned off during class; the penalty for each violation is reduction of your overall course grade by 5%.

### **4. Required textbooks**

Helfman, G.S., B.B. Collette, D.E. Facey, and B.W. Bowen. 2009. The Diversity of Fishes, 2nd edition. Wiley-Blackwell, Inc. [Be sure to get the 2009 edition, not the first edition published in 1997]

Cailliet, G.M., M.S. Love and A.W. Ebeling. 1996. Fishes: A Field and Laboratory Manual on their Structure, Identification, and Natural History. Waveland Press, Inc., Prospect Heights, Illinois.

Kell, V. and K. Carpenter. 2011. A Field Guide to Coastal Fishes from Maine to Texas. Johns Hopkins Press.

### **5. Classroom activities**

Lectures in class 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. You are expected to have read the relevant sections of the textbooks prior to the lectures and labs. The main textbook used for this class (Helfman et al. 2009) is a very extensive book a great source of information.

It is strongly suggested that during lectures you take your own notes. 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 powerpoints used in the class will be made available on the web to all students after each 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 material, it is just a compliment to your own notes. If you miss a class, please contact your classmates, since they will have essential class notes.

## **6. Laboratory activities**

- A. Dissections. You will need a dissecting kit, available at the College Bookstore; always bring the kit to class, because among other activities, the instruments will be needed for handling specimens while making identifications.
- B. Study of the fish skeleton (osteology).
- C. Fish identification:  
Learning to use dichotomous keys. Identification of specimens collected during class field activities. You will also make identifications of a set of 40 unknown lots of fishes (you must work independently, **identifying your own unknowns**); these identifications are to be turned in towards the end of the semester for grading. You are to submit 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.
- D. Standardized measuring (morphometrics) and counting (meristics) of structures used in identification and systematic analysis.
- E. Learning the fishes in the Grice Marine Laboratory reference collection.

## **7. Field activities**

Field activities are an important component of the course. We will make some near-shore collections locally using seine nets and do some trawling in the harbor on board one of the Marine Resources Research Institute (SC DNR) vessels.

During these activities you will use various types of nets and traps to sample the local fish species. We will also measure certain critical environmental parameters, such as temperature and salinity. Among our goals are (a) to report the various fish species found, (b) to compare the fish faunas in various habitats, and (c) to hypothesize factors that could explain any observed differences among the sampled fish species assemblages.

**Proper foot protection (closed-toed shoes or boots) will be needed to participate in field trips, and the instructor will turn back any students not wearing 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](http://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 web-page 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!

## **8. Tests/Exams**

Identification test: Sight recognition of a subset of the first 50 species on the List of Required Fishes.

Final lab practical: **Cumulative** – sight recognition and identification, as in the Identification test, of a subset of all species on the List of Required Fishes.

Mid-term test: Covers all lecture material in the first half of the course.

Final Examination: **Cumulative** – all lecture material, including morphology and osteology, covered in the course.

## **9. Critique project and paper**

Each student will write a critique (review) of an article dealing with fish biology published in a peer-reviewed research journal. Each student will select an article from a list that will be distributed in class. You will read and evaluate the article, and prepare a short paper (4 pages double-spaced maximum, not including Literature Cited, figures, and tables) to be submitted near the end of the course. The project will be done in the second half of the course, after students have gained substantial background knowledge in this field. More details and instructions will be distributed in class.

## **10. Distribution of grades:**

### *Lecture*

A. Mid-term test (lecture-based)	15%
B. Final Examination	20%
C. Critique project	15%

### *Laboratory*

D. Identification test	10%
E. Final lab practical	20%
F. Identification of 40 unknowns	15%
G. Laboratory participation and completion of assignments	05%

## **11. Grading scale:**

A	94-100%
A-	90-93%
B+	87-89%
B	84-86%
B-	80-83%
C+	77-79%
C	74-76%
C-	70-73%
D+	67-69%
D	64-66%
D-	60-63%
F	<60%

## **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

Specified Readings<sup>1</sup> are chapter numbers in the text by Helfman et al. (2009), except CLE = Cailliet et al. (1996), our field and laboratory manual, and MC = Moyle, P.B. and J.J. Cech, Jr. 2000. Fishes: An introduction to ichthyology. 3rd edition. Prentice-Hall, Englewood Cliffs, N.J. (MC on reserve at Marine Resources Library, or short-term loan by me).

Date	Topic	Readings <sup>1</sup>
<b>January</b>		
Thurs 7	Introduction; Systematics and classification; basic fish morphology.	1
Mon 11	Phylogenetics lecture and laboratory: Taxonomic nomenclature and dichotomous keys	2; CLE 7, 9
Thurs 14	More morphology and cranial osteology; general morphology exercise	3; CLE 1, 3
Mon 18	Martin Luther King Day – No Class	
Thurs 21	Post-cranial osteology; library resources introduction	3; CLE 3
Mon 25	Diversity and relationships of fishes I: Agnatha, Chondrichthyes.	11, 12, 13
Thurs 28	Diversity and relationships of fishes II: Osteichthyes, Sarcopterygii, basal Actinopterygii (ray-finned fishes)	11, 13
<b>February</b>		
Mon 1	Diversity and relationships of fishes III: Teleostei through Paracanthopterygii	14
Thurs 4	Diversity and relationships of fishes IV: Acanthopterygii (spiny-rayed fishes): Mugiliformes through Perciformes	15
Mon 8	Introduction to fish ecology: reproduction and social behavior	21,24; CLE 14; MC 9
Thurs 11	Early life history of fishes	9
Mon 15	Fish assemblages in estuaries	MC 31
Thurs 18	<b>MID-TERM Test</b>	
Mon 21	Fresh Water fishes	21/24
Thurs 25	Diversity and relationships of fishes V: Acanthopterygii (spiny-rayed fishes): Tetraodontiformes, Pleuronectiformes	15
Mon 29	Fish reproduction and growth dynamics/fish dissections	10, 21; CLE 12, 14
<b>March</b>		
Thurs 3	<b>Field Trip – Dixie Plantation</b>	
Mon 14	<b>IDENTIFICATION TEST (Required Fishes # 1 –</b>	

	<b>50)</b>	
Thurs 17	Form and function of feeding	8; CLE 13
Mon 21	Form and function of locomotion	8; MC 2
Thurs 24	<b>Field activity: Seining Folly Beach</b> (low tide 3:32 (0.0 ft)	CLE 10
Mon 28	<b>Field Activity – R/V SILVER CRESCENT</b> (1:00 – 3:00; 3:00 – 5:00)	
Thurs 31	Gas bladders and buoyancy control; <b>FIRST 10 IDENTIFICATIONS of UNKNOWNNS DUE</b>	4, 5, 7
<b>April</b>		
Mon 4	Schooling behavior; <b>CRITIQUE PAPER DUE</b>	MC 33
Thurs 7	<b>Field activity: Seining in Grice Cove</b> (low tide 2:51; -1.0 ft); More keying of species	CLE 10
Mon 11	Circulation, gas exchange, thermal biology;	5
Thurs 14	Speciation and biogeography	16
Mon 18	Biodiversity and conservation; <b>IDENTIFICATIONS OF ALL UNKNOWNNS DUE</b>	25
Thurs 21	<b>FINAL LAB PRACTICAL (cumulative)</b>	
Mon 25	<b>FINAL EXAMINATION: GML 101, 12:00 – 3:00 PM</b>	