

BIOLOGY OF FISHES; BIOL 335 - 02
Syllabus
Fall Semester 2016

Class schedule and locations

Lecture: Friday 9:00 – 12:00 PM, Grice Marine Laboratory room 101/201

Laboratory: Friday 1:30 – 4:30 PM, Grice Marine Laboratory room 101/201

Instructor

William (Bill) Roumillat (Adjunct Biology Faculty), Grice Marine Laboratory, College of Charleston, 205 Fort Johnson, Charleston, SC 29412. telephone (843) 906-2270; email roumillatba@cofc.edu

Office hours and location: GML Rm. 119. Mail boxes located in GML 108. Office hours: Mon and Thursday 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.

Student learning outcomes

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

Recognize 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.

Demonstrate 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 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]

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

Reserved in Marine Resources Library: Moyle, P.B. and J.J. Cech, Jr. 2000. Fishes: An introduction to ichthyology. 3rd edition. Prentice-Hall, Englewood Cliffs, N.J.

Recommended laboratory manual: 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.

5. Classroom activities (55% of final grade)

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 immediately prior to each lecture**, but this is not an excuse for you not to take notes or to stop attending the classes. Under no circumstances should you believe that you can pass this course by just reading the material, it is just a complement to your own notes. If you miss a class, please contact your classmates, since they will have essential class notes.

6. Laboratory activities (40% of final grade)

- 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 unknown specimens**); 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, 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	20%

Laboratory

D. Identification test	10%
E. Final lab practical	10%
F. Identification of 40 unknowns	20%
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%

12. Disabilities accommodation

The College will make reasonable accommodations for persons with documented disabilities. Students should apply at the Center for Disability Services / SNAP, located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me one week before accommodation is needed.

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 Readings¹ 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).

Date	Topic	Readings ¹
August		
Fri 26 am	Introduction; Systematics and classification; basic fish morphology.	1
Fri 26 pm	Phylogenetics lecture and laboratory: Taxonomic nomenclature and dichotomous keys	2; CLE 7, 9
September		
Fri 2 am	More morphology and cranial osteology; general morphology exercise	3; CLE 1, 3
Fri 2 pm	Post-cranial osteology; library resources introduction	3; CLE 3
Fri 9 am	Diversity and relationships of fishes I: Agnatha, Chondrichthyes.	11, 12, 13
Fri 9 pm	Diversity and relationships of fishes II: Osteichthyes, Sarcopterygii, basal Actinopterygii (ray-finned fishes)	11, 13
Fri 16 am	Diversity and relationships of fishes III: Teleostei through Paracanthopterygii	14
Fri 16 pm	Field activity - Dixie Plantation	
Fri 23 am	Diversity and relationships of fishes IV: Acanthopterygii (spiny-rayed fishes): Mugiliformes through Perciformes Diversity and relationships of fishes V: Acanthopterygii (spiny-rayed fishes): Tetraodontiformes, Pleuronectiformes	15
Fri 23 pm	Introduction to fish ecology: reproduction and social behavior	21,24; CLE 14; MC 9
Fri 30 pm	Field Activity – R/V SILVER CRESCENT	

	(1:00 – 3:00; 3:00 – 5:00)	
October		
Fri 7 am	Fish assemblages in estuaries FIRST 10 IDENTIFICATIONS of UNKNOWNNS DUE	MC 31
Fri 7 pm	MID-TERM Test	
Fri 14 am	Fresh Water fishes	21/24
Fri 14 pm	Early life history of fishes	9
Fri 21 am	IDENTIFICATION TEST (Required Fishes # 1 – 50)	
Fri 21 pm	Fish reproduction and growth dynamics/fish dissections	10, 21; CLE 12, 14
Fri 28 am	Form and Function of feeding	8; CLE 13
Fri 28 pm	Field activity: Seining Folly Beach (low tide 12:30 (0.15m))	CLE 10
November		
Fri 4 am	Form and function of locomotion	8; MC 2
Fri 4 pm	Coral Reef fish ecology	MC 33
Fri 11 am	Gas bladders and buoyancy control;	4, 5, 7
Fri 11 pm	Field activity: Seining in Grice Cove (low tide 3:50; -0.3m); More keying of species	CLE 10
Fri 18 am	Schooling behavior; CRITIQUE PAPER DUE	MC 33
Fri 18 pm	Circulation, gas exchange, thermal biology;	5
Fri 25	Thanksgiving Break	
December		
Fri 2 am	Speciation and biogeography	16
Fri 2 pm	Biodiversity and conservation; IDENTIFICATIONS OF ALL UNKNOWNNS DUE FINAL LAB PRACTICAL (cumulative)	25
Wed 14	FINAL EXAMINATION: GML 101, 8:00 – 11:00	