Roger Williams University
Spring 2008
BIO 302 and 302L: Ichthyology

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Office hours: Monday & Wednesday, 1:00-3:00 PM, or by appointment

Course Description and Objectives: *Ichthyology* provides a comparative examination of the evolution, morphology, physiology, and natural history of fishes from a diverse range of habitats. Correspondingly, an underlying theme of the course is the behavioral and functional adaptations of fishes that allow these animals to survive in different environments. While course material provides students with an appreciation of the tremendous diversity that exists among fishes, particular emphasis is placed on species inhabiting local environments. Upon completing the course, students will first understand the ecology and evolution of fishes, and second, recognize the challenges imposed on fishes and the means by which groups have adapted to their specific environment. Laboratory sessions include comparative studies of selected examples and field trips to local environments.

Students are evaluated by a series of lecture and laboratory exams and synopses of seminar speakers. Collectively these items gauge a student's understanding of course material and the ability to observe, document, and synthesize information presented in lecture and laboratory. Moreover, students are required to complete a research grant proposal that includes an annotated outline, final paper, and oral presentation at the end of the semester. The objective of this assignment is to enhance written and communication skills, and further require students to formulate well-designed questions and gain experience in experimental design.

Course Information: Lecture No. 17738 (Section 01), Laboratory No. 17739 (Section 51), Credits 4.0

Lecture Time and Location: Monday, Wednesday, & Friday 11:00-11:50 AM, CAS 223

Laboratory Time and Location: *Ichthyology* has a required laboratory component (BIO 302L) meeting Tuesday 2:00-4:50 PM, MNS 107. Note that inclement weather or time constraints may postpone field-based labs to the following Saturday.

Lecture Text (Required):

(1) Barton, M. 2007. Bond's Biology of Fishes, 3rd Edition, Thomson Brooks/Cole.

Laboratory Text (Required):

(1) Page, L.M., and Burr, B.M. 1991. Peterson Field Guide Series: A Field Guide to Freshwater Fishes, North America, North of Mexico. Houghton Mifflin Company.

(2) Robins, C.R., Ray, C., and Douglass, J. 1999. Peterson Field Guide Series: A Field Guide to Atlantic Coast Fishes, North America. Houghton Mifflin Company.

Lecture and Laboratory Website: Two websites for lecture and laboratory have been designed for this course using "Blackboard" software. The Blackboard site is accessed through *myRWU*. Contact the Blackboard administrator, Bonnie Hatch, at bbtech@rwu.edu for access problems.

Exams: Students are evaluated by three lecture exams (100 pts each), one laboratory exam (100 pts), and a final exam (100 pts). The first lecture and laboratory exam include material from the start of class. Subsequent exams (including the final) are non-cumulative, and thus, include only the material covered since the previous exam.

Research Grant Proposal (Outline, Proposal, & Presentation): Students are required to write a research grant proposal that follows a similar format to that of the Center for Economic and Environmental Development (CEED) at Roger Williams University (http://fcas.rwu.edu/biology/research-s.htm). This assignment includes an annotated outline of the proposed research (25 pts; due Friday, March 28), a final grant proposal (50 pts; due Friday, April 11), and an oral presentation of the proposal (50 pts; presentations scheduled Tuesday, April 29). Students can work individually or together in small groups (2-3) and will choose a research topic in consultation with the professor (proposal topics due Friday, February 29). The subject of the proposed research must be fish-related and constitute a carefully designed laboratory and/or field experiment. The content of the research is to the discretion of the student(s), but it must be sufficiently focused so that the intended data collection period can be done within a 6-month period and from the confines of RWU and/or its immediate area. Specific details of the research grant proposal will be provided throughout the semester and posted on the class website.

Final Laboratory Report: Students are required to write a final laboratory report that presents and analyzes the data collected during field-based laboratory exercises, and further discusses the information within the larger framework of the entire course. The report should discuss any combination of ecological, morphological, or taxonomic characteristics in the field data among sampling sites. For example, how are fish species distributed across varying habitats, i.e., freshwater ponds and rivers, brackish water, and estuaries? Do abundance patterns and species diversity differ among sites? What life stages are represented within each habitat and are any species found across multiple sites? What biotic and abiotic

factors regulate habitat-specific abundances? How are resident species morphologically and physiologically adapted to the environments in which they live? Do observed patterns of species diversity, abundance, and size distributions reflect those reported in the published literature?

The final laboratory report is to be written in proper scientific format, and thus, contain the following sections: Abstract, Introduction, Material and Methods, Results, Discussion, and Literature Cited. The final report will be collected on the last scheduled laboratory session (Tuesday, May 6) and graded out of 100 points. Specific details of the final laboratory report will be provided throughout the semester and posted on the class website.

Seminar Synopses: Students are to attend two of the Science and Mathematics Seminars and write a brief synopsis of each presentation. The synopsis should include: (1) a thorough account of the speaker's presentation, (2) significance of the topic(s) covered, and (3) the student's personal evaluation of the speaker (*positives and negatives*). Each assignment is graded out of 25 point and are due Friday, April 4 (1st synopsis) and Monday, May 5 (2nd synopsis). Students may turn in assignments before the posted due date. A listing of speakers and topics of the seminars is found at http://departments.rwu.edu/biology/seminar.htm. Seminars are held in MNS 200 and begin at 4:00 PM (typically Wednesday), unless noted otherwise.

Professor Meeting: Students are to schedule at least one meeting with the professor before Spring Recess (Friday, March 14). Meetings lasting approximately 30 minutes may involve discussions about the class or any other number of topics. The objective of each meeting is to increase the communication between student and professor. By understanding student interests and ambitions, I, as professor, will be better prepared to design a curriculum that benefits both student and teacher. Students participating in one professor meeting receive 25 points added to their final grade. Students who do not attend a meeting receive a zero for this assignment.

Make-Up Exams: To be eligible to take a make-up exam you MUST contact me *prior to* the regularly scheduled exam time/date or provide valid University excuse (documentation). A grade of zero will be recorded if the student does not strictly follow this procedure.

Extra Credit: There are no extra credit assignments.

Lecture Attendance: Attendance will not be recorded throughout the semester for lecture, but I *strongly suggest* students come to class (see *Roger Williams University 2007-2008 Undergraduate Catalog*. p. 60). There is a tremendous amount of material covered in the course, and a student's overall success in learning the material depends on their attendance. Daily quizzes may be administered if attendance drops below suitable levels as deemed by the professor.

Laboratory Attendance: Attending laboratory sessions is mandatory. Failure to attend laboratory sessions without a valid University excuse (documentation) will result in the deduction of 10 points from the laboratory final grade for each offense.

Deadlines and Penalties: Assignments discussed above are due by 5:00 PM of the identified deadline. Assignments may be submitted in hard copy or via email attachments. Failure to turn in assignments by the scheduled deadline will result in a deduction of one letter grade per 24 hours. A grade of zero will be recorded for assignments not turned in within 5 days of the scheduled deadline.

Academic Standards: Students enrolled in *Ichthyology* are expected to abide to the "Academic Integrity Undergraduate Pledge". The definitions and penalties for violations of academic integrity apply to this course (see *Roger Williams University 2007-2008 Undergraduate Catalog*. p. 57-59). Moreover, students agree that by taking this course all required papers may be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of Turnitin.com service is subject to Terms and Conditions of Use posted on the Turnitin.com site.

Disabilities: If a student has a disability that qualifies under the Americans with Disabilities Act and requires accommodations, he/she should contact the Office of Academic Development, located in the University Library, for information on appropriate policies and procedures.

Student Health Statement: Some procedures and materials utilized in the laboratory may pose a health risk to certain individuals. If you suspect that your involvement in laboratory may compromise your health, consult Health Services before participating in any laboratory activities.

Important Dates from the Academic Calendar, Spring Semester 2008:

23-Jan (Wed):	All spring classes begin
29-Jan (Tues):	Last day to add a course without instructor's permission
4-Feb (Mon):	Last day to add a course with instructor's permission
19-Feb (Tues):	Last day to drop a course without the W (withdrawal) grade
6-Mar (Thurs):	Warning Grades due in the Office of the Registrar
31-Mar (Mon):	Last day to drop a course and receive the W (withdrawal) grade
6-May (Tues):	Last day of classes

Evaluation and Grading Policy:

Lecture and Laboratory Grades	Test or Assignment Due Date		Points
Lecture Exam 1	20-Feb	Wed	100
Lecture Exam 2	21-Mar	Fri	100
Lecture Exam 3	16-Apr	Wed	100
Final Exam	13-May	Tues	100
Proposal Outline	28-Mar	Fri	25
Proposal Paper	11-Apr	Fri	50
Proposal Presentation	29-Apr	Tues	50
Laboratory Practical	4-Mar	Tues	100
Laboratory Final Report	6-May	Tues	100
Seminar Synopses (25 pts each)	4-Apr (I), 5-May (II)	Fri (I), Mon (II)	50
Professor Meeting	14-Mar	Fri	25
TOTAL			**800**

Total Points	Percentage	Final Grade
800-740	100-93	A
739-716	92-90	A-
715-692	89-87	B+
691-660	86-83	B
659-636	82-80	B-
635-612	79-77	C+
611-580	76-73	C
579-556	72-70	C-
555-532	69-67	D+
531-500	66-63	D
499-476	62-60	D-
<476	< 60	F

LECTURE SCHEDULE

Date		Topic	Chapter reading
23-Jan	Wed	Syllabus: Introduction	-
25-Jan	Fri	Science of ichthyology and systematic procedures	1,2
		Architecture of Fishes	-
28-Jan	Mon	External anatomy: General morphology and fins	3
30-Jan	Wed	External anatomy: Skin and scales	3,18
1-Feb	Fri	External anatomy: Evolution of fish morphology	3
4-Feb	Mon	Internal anatomy: Skeletal system	3
6-Feb	Wed	Internal anatomy: Muscle system	3,19
		Evolution and Phylogeny	-
8-Feb	Fri	Early chordates to the first fishes	2
11-Feb	Mon	Early chordates to the first fishes	2
13-Feb	Wed	History of fishes: Jawless fish	5
15-Feb	Fri	History of fishes: Jawless fish	5
18-Feb	Mon	**No class/Presidents Day**	-
20-Feb	Wed	**EXAM I**	-
22-Feb	Fri	History of fishes: Cartilaginous fish	6
25-Feb	Mon	History of fishes: Cartilaginous fish	6
27-Feb	Wed	History of fishes: Bony fish	7-9
29-Feb	Fri	History of fishes: Bony fish (Proposal topic due)	7-9
		Bioenergetics	-
3-Mar	Mon	Gills	24
5-Mar	Wed	Ventilation and respiration	24
7-Mar	Fri	Ventilation and respiration	24
10-Mar	Mon	Circulation and gas transport	24
12-Mar	Wed	Circulation and gas transport	24

14-Mar	Fri	**EXAM III** (Professor meeting deadline)	-
17/19/21-Mar	Mon/Wed/Fri	**No class/Spring recess**	-
24-Mar	Mon	Energy budgets: Ingestion and excretion	23
26-Mar	Wed	Energy budgets: Metabolism and growth	23
28-Mar	Fri	Energy budgets: Growth (Proposal outline due)	23
		Perceiving the Environment and Homeostasis	-
31-Mar	Mon	Sensory systems: Mechanoreception	20-22
2-Apr	Wed	Sensory systems: Vision and chemoreception	20-22
4-Apr	Fri	Sensory systems: Electroreception and electrogenic fish (Seminar synopsis I due)	20-22
7-Apr	Mon	Thermoregulation	-
9-Apr	Wed	Thermoregulation	-
11-Apr	Fri	Osmoregulation (Final proposal due)	25
14-Apr	Mon	Osmoregulation	25
16-Apr	Wed	**EXAM III**	-
18-Apr	Fri	Buoyancy and locomotion	19
21-Apr	Mon	Buoyancy and locomotion	19
		Biological Interactions and Ecology	-
23-Apr	Wed	Feeding (Final proposal due)	23
25-Apr	Fri	Feeding	23
28-Apr	Mon	Reproduction and development	27
30-Apr	Wed	Reproduction and development	27
2-May	Fri	Behavior and communication	36,37
5-May	Mon	Behavior and communication (Seminar synopsis II due)	36,37
13-May	Tues	**FINAL EXAM**	2:00-4:00 PM

TENTATIVE LABORATORY SCHEDULE

Date		Topic
29-Jan	Tues	Taxonomic characters and classification
5-Feb	Tues	Hagfish and Lamprey dissection
12-Feb	Tues	Shark and Skate dissection
19-Feb	Tues	Bowfin and Perch dissection
26-Feb	Tues	Review session for Laboratory Practical
4-Mar	Tues	**Laboratory Practical**
11-Mar	Tues	Lafayette State trout hatchery
18-Mar	Tues	**No lab/Spring recess**
29-Mar	Sat	Lake field trip: Worden and Tucker Ponds
5-Apr	Sat	River field trip: Narrow River
8-Apr	Tues	Brackish water field trip: Kickimuit River
12-Apr	Sat	Benthic Ecology Meeting, Providence, RI
15-Apr	Tues	Estuary otter trawl field trip: Narragansett Bay
22-Apr	Tues	Estuary beach seine field trip: Common Fence Point
29-Apr	Tues	Research Proposal Presentations
3-May	Sat	New England Aquarium
6-May	Tues	Gilbert Stuart fish ladder (Final Lab Report Due)