EEOB 5930: Ichthyology

Instructors
Suzanne M. Gray, Assistant Professor, School of Environmental and Natural Resources, The Ohio State University, gray.1030@osu.edu
Marc R. Kibbey, Associate Curator of Fishes, The Ohio State University, kibbey.3@osu.edu
Brian J. Zimmerman, Fish Collecting Coordinator at the Museum of Biological Diversity and Fish Reintroduction Coordinator with ODNR and OSU Wetlands, The Ohio State University, zimmerman.256@osu.edu

Course Logistics
Five-week course held at Stone Laboratory, Put-in-Bay, Ohio, June 18- July 22, 2017.
First Sunday, check-in, orientation, and evening class. Regular class meetings are then every Monday, Wednesday, Friday, 8 am - 5 pm with breaks for lunch and dinner (further evening class activities may also be scheduled); last Friday and Saturday are altered schedules, 8 am - 12 pm.

Course Format
Four semester credit hours consisting of lecture, field work and laboratory time.

Course Description
This course will introduce students to the diversity of fishes. Representative species from ecologically, commercially and phylogenetically important families of the fishes will be studied but emphasis will be placed on fish species of the Laurentian Great Lakes. By exploring the physiological processes that enable the fishes to exploit and interact with their environments and each other the Interconnectedness of fish populations/assemblages and what drives those relationships will be discovered. A survey of behavioral and ecological implications of evolution and morphological differences will be examined, as will a review of anthropological influences and the changes wrought on fish distributions and population assemblages. The field and laboratory portions of the course will enable students to gain hands-on experience in the collection, preservation, identification, anatomy and morphology of fishes found in Lake Erie and nearby streams, rivers, and wetlands. Field and laboratory exercises will also provide opportunities to evaluate natural history and ecological patterns.

Course Objectives:
• Understand relationships between morphology, physiology, and ecology
• Evaluate patterns between phenotypic expression based on fish morphology and behavior
• Use dichotomous keys to identify fishes of the Great Lakes basin
• Learn external and internal fish anatomy and scientific nomenclature
• Become familiar with methods of collecting and studying fishes through hands-on field and laboratory experience

Teaching Approach:
The course will be taught using a combination of lectures, discussions, laboratory exercises, field trips, and group projects. Field experience will enable students to learn about fish preferred habitat, natural history, and behavioral patterns.
Course Materials
Required:

Highly recommended if you plan to pursue a career in North American freshwater fish ecology. Available for online purchase in May through the OSU Marion Bookstore website.


Available for use at Stone Laboratory:
Trautman, M.B. 1981. The Fishes of Ohio. The Ohio State University Press, Columbus, OH.


Course Outline (Subject to Change)

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Description</th>
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<tbody>
<tr>
<td>Sunday:</td>
<td>4:00p - 5:00p</td>
<td>Orientation: Introduction to Stone Laboratory</td>
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<td>5:00p - 5:45p</td>
<td>Dinner</td>
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<td>6:30p – 7:30p</td>
<td>Course intro</td>
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<tr>
<td>Week One</td>
<td></td>
<td><strong>Introduction, Fish Morphology and Lower Fishes</strong></td>
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<tr>
<td>Monday:</td>
<td>7:00a - 7:45a</td>
<td>Breakfast</td>
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<tr>
<td></td>
<td>8:00a - 9:00a</td>
<td><strong>Lecture I:</strong> Introduction to Ichthyology, museums, online resources, external fish morphology and characters</td>
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<td></td>
<td>9:00a - 12:00a</td>
<td><strong>Field Trip:</strong> Seining at Alligator Bar, collect fish fauna</td>
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<td>12:00p - 12:45p</td>
<td>Lunch</td>
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<td>1:00p – 3:45p</td>
<td><strong>Lab I:</strong> Taxonomy - introduction to methods including use of dichotomous keys, preservation of specimens, sort and identify Alligator Bar fish species</td>
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<td>3:45p – 4:00p</td>
<td>break</td>
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<td>4:00p – 4:45p</td>
<td><strong>Lecture II:</strong> Lungfishes, Hagfishes, Lampreys, Sharks, Rays and Chimeras</td>
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<td></td>
<td>5:00p – 5:45p</td>
<td>Dinner</td>
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<tr>
<td></td>
<td>6:00p – 7:00p</td>
<td>Open Review</td>
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</tbody>
</table>
Wednes.: 7:00a - 7:45a Breakfast  Instructor: Marc Kibbey
8:00a – 9:00a Lecture III: Architecture of the fishes – Skeleton, Skin and Scales
9:00a - 9:15a Break
9:45a - 12:00p Lab II: Dipnoi, agnathans, elasmobranchs, and holocephalans
12:00p - 12:45p Lunch
1:00p - 4:00p Field Trip: Gibraltar Island Beach
Lab III: Taxonomy, sort and identify Gibraltar Beach fish species
4:00p – 4:45p Lecture IV: Soft Anatomy
5:00p - 5:45p Dinner
6:00p - 7:00p Open review (student’s option)

Friday: 7:00a -7:45a Breakfast  Instructor: Brian Zimmerman
8:00a – 4:45p Field Trip: Lake sampling aboard R/V GIBRALTAR III
(Collect fish samples) and North Bass Island
12:00p – 12:45p Lunch (sack lunches provided)
5:00p - 5:45p Dinner
6:00p - 7:00p Open review (student’s option)

Week Two  Physiology, Field Methods and a Step Up in Phylogeny

Monday: 7:00a - 7:45a Breakfast  Instructor: Marc Kibbey
8:00a - 9:00a Lecture V: Oxygen Requirements, Respiration and Circulation, Metabolism and Energetics
9:00a - 11:00a Field Trip: Seining at Gibraltar Isle Beach, collect fish and data
11:00a – 11:45a Quiz I: Lectures I-IV and Labs I-III
12:00p - 12:45p Lunch
1:00p – 3:45p Lab IV: Taxonomy, sort and identify Gibraltar Beach, Open Water Trawled and North Bass Island fish species, dissections
3:45p – 4:00p Break
4:00p – 4:45p Lecture VI: Sturgeon and Paddlefish, Bichirs and Reedfish, Gars and Bowfin
5:00p - 5:45p Dinner
6:00p - 7:00p Open Review (student’s option)

Wednes.: 7:00a - 7:45a Breakfast  Instructor: Marc Kibbey
8:00a - 9:30a Lecture VII & Lab V: IBI and LIBI, QHEI and LQHEI
9:30a - 9:45a Break
9:45a - 12:00p Lab VI: chondrosteans, cladistians, and lower neopterygians (holosteans)
12:00p - 12:45p Lunch
1:00p - 4:00p Field Trip: Perry’s Monument Beach and Terwilliger’s Pond
4:15p – 4:45p Lab Practial I: Labs I-IV
5:00p - 5:45p Dinner
6:00p - 7:00p Open review (student’s option)

Friday: 7:00a - 7:45a Breakfast  Instructor: Brian Zimmerman
8:00a – 4:00p Field Trip: Mainland: Miller Blue Hole, Pickerel Creek and Castalia Hatchery
Watersheds: Life in cold-water streams, and East Harbor Shock Boat sampling: The Spotted Gar Lives!
12:00p - 12:45p Lunch (Sack lunches provided)
5:00p - 5:45p Dinner
6:00p - 7:00p Open review (student’s option)
Week Three

**Monday:**
- 7:00a - 7:45a Breakfast  
  Instructor: Marc Kibbey
- 8:00a - 9:00a *Lecture VIII*: Homeostasis, Locomotion and Feeding
- 9:00a – 11:45a *Field Trip*: Middle Bass Island
- 12:00p - 12:45p Lunch
- 1:00p – 3:15p *Lab VII*: Taxonomy: sort and identify Perry’s Monument Beach, Terwilligers Pond and Mainland fish species, dissections
- 3:15p – 3:30p break
- 3:30p – 4:00p *Quiz II*: Lectures V-VII, Labs IV-VI
- 4:00p – 4:45p *Lecture IX*: Eels, Bonytongues, Minnows, Tetras and Catfish, Shad, Trout and Cod
- 5:00p – 5:45p Dinner
- 6:00p – 7:00p Open Review (student’s option)

**Wednes.:**
- 7:00a - 7:45a Breakfast  
  Instructor: Marc Kibbey
- 8:00a - 9:00a *Lecture X*: Sensory Systems, Reproduction and Ontogeny
- 9:00a – 9:15a Break
- 9:30a - 12:00p *Lab VII*: elopomorphs, osteoglossomorphs, ostariophysans, clupeamorphs, protocanthopterygians and paracanthopterygians
- 12:00p - 12:45p Lunch
- 1:00p - 4:00p *Field Trip*: Middle Bass Island, collect fish and data
- 4:00p – 4:45p *Lecture XI*: Adaptations, Habitats, Zoogeography
- 5:00p – 5:45p Dinner
- 6:00p – 7:00p Open review (student’s option)

**Friday:**
- 7:00a - 7:45a Breakfast  
  Instructor: Brian Zimmerman
- 8:00a – 4:00p *Field Trip*: Mainland Warmwater Streams: Maumee River at Grand Rapids Dam: Sand Darters galore! and Cranberry Run or Auglaize River: Reintroduction of Pirate Perch a rousing success!
- 12:00p - 12:45p Lunch (sack lunch provided)
- 5:00p – 5:45p Dinner
- 6:00p – 7:00p Open review (student’s option)

**Week Four**

**Monday:**
- 7:00a - 7:45a Breakfast  
  Instructor: Marc Kibbey
- 8:00a – 8:45a *Lab Pracitical II*: Labs V-VII
- 8:45a – 11:45a *Field Trip*: NE South Bass Island Beach, collect fish and data
- 12:00p - 12:45p Lunch
- 1:00p – 3:45p *Lab VIII*: Taxonomy, sort and identify Mainland, SBI fish species, dissections
- 3:45p – 4:00p Break
- 4:00p – 4:45p *Lecture XII*: Mullets, Perches and Puffers
- 5:00p – 5:45p Dinner
- 6:00p – 7:00p Open review (student’s option)

**Wednes.:**
- 7:00a - 7:45a Breakfast  
  Instructor: Marc Kibbey
- 8:00a – 8:30a *Quiz III*: Lectures VIII-XII and Lab VIII
- 8:30a – 11:45a *Lab IX*: acanthopterygians
- 12:00p - 12:45p Lunch
- 1:00p – 4:00p *Lab XII*: acanthopterygians
- 4:00p – 5:00p *Lecture XIII*: Threats to the Diversity of Fishes, Conservation
- 5:00p – 5:45p Dinner
- 6:00p – 7:00p Open review (student’s option)
Friday:

7:00a - 7:45a  Breakfast  
Instructor: Brian Zimmerman

8:00a – 4:45p  Field Trip: Mainland Trips – More Warm-water Streams: 
Sandusky River at Tiffin, Ohio Pioneer Mill Dam for River Redhorse and Greater Redhorse, and Huron River at Milan Nature Preserve for Bigeye Chub

12:00p - 12:45p  Lunch (sack lunch)
5:00p - 5:45p  Dinner
6:00p - 7:00p  Open review (student’s option)

Week Five  
Field trips and projects to explore applied behavior and ecology of fishes

Monday:

7:00a - 7:45a  Breakfast  
Instructor: Suzanne Gray

8:00a - 11:45 p  Behavior, Ecology and Research Project – experimental design

12:00p - 12:45p  Lunch
1:00p - 4:45p  Snorkeling and Observation
5:00p – 5:45p  Dinner
6:00p – 7:00p  Work on Research Project

Wednes.

7:00a - 7:45a  Breakfast  
Instructor: Suzanne Gray

8:00a - 11:45 a Behavior, Ecology and Research Project – data collection

12:00p - 12:45p  Lunch
1:00p - 4:45p  Snorkeling and Observation
5:00p – 5:45p  Dinner
6:00p – 7:00p  Work on Research Project

Friday:

7:00a - 7:45a  Breakfast  
Instructor: Suzanne Gray

8:00a – 8:30a  Quiz IV: Applied Behavior and Ecology of Fishes

8:30a - 11:45a  Research Project – analysis and interpretation

12:00p - 12:45p  Lunch

Saturday:

7:00a - 7:45a  Breakfast

8:00a - 9:00a  Course review (student’s option), Report Due
9:00a - 10:00a  Laboratory Practical Final
10:00a - 12:00p  Final Exam
12:00p - 12:45p  Lunch

**Major Assignments**

**Quizzes:** A written quiz consisting of 10-15 short answer, multiple choice, true and false, and/or fill-in-the-blank style questions. You will be tested on material covered in lectures and the textbook readings.

**Research Project Report:** A short observational and/or experimental research project developed and carried out by the group from hypothesis building, experimental design, data collection, analysis and interpretation and writing of a short scientific paper. You will work as a team to develop a research question centered on an applied aspect of fish behavior and ecology.

**Laboratory Practical:** A 45 minute-long examination with questions pertaining to organism identification, structure, and function, performance-based assessments on microscope usage and sampling techniques, and other questions as decided by your instructor on material covered during the lab and field components of this course.

**Final Exam:** A two-hour long written exam consisting of essay, short answer, multiple choice, true and false, and/or fill-in-the-blank style questions. You will be tested on material covered in lectures and the textbook readings. The final exam will have some questions similar to your quizzes, but will also include more in-depth critical thinking questions.
Grading Information
Grading will be based on laboratory practicals (two midterm and one final for 10% each), written exams (four quizzes 8% each, a final exam 20%), a research project report (10%), and participation (8%). Students will be expected to actively participate in the learning process in all aspects of the course in the field and classroom.

Grading Scale

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<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>93-100%</td>
<td>A</td>
</tr>
<tr>
<td>90-92.9%</td>
<td>A-</td>
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<tr>
<td>87-89.9%</td>
<td>B+</td>
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<tr>
<td>83-86.9%</td>
<td>B</td>
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<tr>
<td>80-82.9%</td>
<td>B-</td>
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<td>77-79.9%</td>
<td>C+</td>
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<tr>
<td>73-76.9%</td>
<td>C</td>
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<td>70-72.9%</td>
<td>C-</td>
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<td>67-69.9%</td>
<td>D+</td>
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<tr>
<td>60-66.9%</td>
<td>D</td>
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<tr>
<td>&lt;60%</td>
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Attendance Policy
Students are expected to actively participate in all class sessions, including lectures, fieldwork and laboratory time.

Academic Misconduct
It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed: illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

Disability Services
Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 089 Baker Hall, 113 W. 12th Ave.; telephone 614-292-3307, TDD 614-292-0901; http://www.slds.osu.edu/.