Syllabus

Course:	BIO 362 Fisheries Biology (4 credits)
Semester:	Fall 2018
Lecture:	11:30 AM – 12:45 PM, Tuesday & Thursday, 2225 Kindschi Hall of Science (KHS)
Lab:	2:00 – 4:50 PM, Thursday, 1170 KHS
Instructor:	Dr. Carl Ruetz, Annis Water Resources Institute (AWRI)
Office/ Telephone:	*Muskegon*: 136 Lake Michigan Center/616-331-3946[1] *Allendale*: 3394 KHS/616-331-9357
E-mail:	ruetzc@gvsu.edu
Website:	http://www.gvsu.edu/wri/ruetz/
Office Hours:	1:00 – 2:00 PM, Tuesday (3394 KHS) If this time is not convenient, then please contact me to schedule an appointment.
Blackboard:	Announcements, schedule changes, and grades will be posted online. To access Blackboard, go to the GVSU website (www.gvsu.edu), click on the link "Bb" (top right).
Texts (Required):	Helfman, G.S., B.B. Collette, D.E. Facey, and B.W. Bowen. 2009. The diversity of fishes: biology, evolution, and ecology, 2nd edition. Wiley-Blackwell. Hubbs, C.L., K.F. Lagler, and G.R. Smith. 2004. Fishes of the Great Lakes region, Revised edition. The University of Michigan Press.

Prerequisites: BIO 120 General Biology I (recommended) and BIO 121 General Biology II. Some background in biology and ecology is recommended. If you are concerned that your background may be insufficient for this course, then please discuss this with the instructor.

Goals & Objectives: This course will provide basic coverage of the diversity and biology of fishes (both freshwater and marine) and briefly introduce concepts related to fisheries management. Emphasis will be placed on species inhabiting the Great Lakes basin. After the successful completion of this course, student will be able to:

1. Describe the major groups of fishes and their evolutionary relationships.
2. Describe the morphology, physiology, and biology of fish.
3. Identify Michigan fishes to the level of family, genus, and species.
4. Apply basic strategies to manage fish populations.
5. Summarize and critically evaluate scientific papers related to fisheries biology.

[1] Please call my Muskegon telephone number to leave messages.

Course Schedule:

Date	Topic
8/28	*Lecture*: Introduction & major groups of fishes (Helfman, Ch. 1)
8/30	*Lecture*: General morphology (Hubbs, pp. 29-31; Helfman, pp. 33-39, 126); history (Helfman, pp. 6-7; Latta 2006) *Lab*: Identification basics (Hubbs, pp. 27-55); Fish identification (Petromyzontidae, Polyodontidae, Acipenseridae, Lepisosteidae, Amiidae, Anguillidae, Clupeidae)
9/4	*Labor Day recess!*
9/6	*Lecture*: Classification & systematics (Helfman, Ch. 2) *Lab*: **Lab Quiz 1**; Fish identification (Catostomidae, Ictaluridae); **Paper Discussion 1**—Professional development (Hamel et al. 2018)
9/11	*Lecture*: Jawless fishes (Helfman, pp. 234-240; Hubbs, pp. 55-56)
9/13	*Lecture*: **Quiz 1**; Passive fish capture techniques; Jawless fishes (cont.) *Lab*: **Field Trip 1**—Fyke netting (Meet at KHS loading dock)
9/18	*Lecture*: Chondrichthyes (Helfman, Ch. 12)
9/20	*Lecture*: Chondrichthyes (cont.) *Lab*: **Lab Quiz 2**; Fish identification (Esocidae, Umbridae, Osmeridae); **Paper Discussion 2**—Shark conservation (Ferretti et al. 2015)
9/25	*Lecture*: **Exam 1**
9/27	*Lecture*: Sarcopterygii (Helfman, pp. 242-248) *Lab*: **Lab Quiz 3**; Fish identification (Salmonidae)
10/2	*Lecture*: Sarcopterygii (cont.)
10/4	*Lecture*: Electrofishing techniques; Actinopterygii (Helfman, pp. 248-259; Hubbs, pp. 60-63) *Lab*: **Field Trip 2**—Backpack electrofishing (Meet at KHS loading dock)
10/9	*Lecture*: Actinopterygii (Helfman, Ch. 14; Hubbs, pp. 66-173[2])
10/11	*Lecture*: Actinopterygii (Helfman, Ch. 15; Hubbs, pp. 176-224[2]) *Lab*: **Lab Quiz 4**; Fish identification (Cyprinidae); **Paper Discussion 3**—Olfactory imprinting (Bett et al. 2016)
10/16	*Lecture*: Actinopterygii/Invasive species (Helfman, pp. 597-605; Kerr et al. 2005; Hinterthuer 2012); **Reference-Set Topic due**
10/18	*Lecture*: Active fish capture techniques; Osmoregulation (Helfman, pp. 100-105) *Lab*: **Field Trip 3**—Trawling on the D.J. Angus Research Vessel (Meet at KHS loading dock)
10/23	*Lecture*: **Quiz 2**; Circulation (Helfman, pp. 45-48)
10/25	*Lecture*: Respiration (Helfman, pp. 57-66); Temperature relationships (Helfman, pp. 43, 94-99) *Lab*: **Lab Quiz 5**; Fish identification (Percopsidae, Apredoderidae, Gadidae, Fundulidae, Atherinopsidae, Gasterosteidae, Cottidae, Moronidae, Centrarchidae); **Paper Discussion 4**—Invasive species (Fitzgerald et al. 2016)

[2] Focus on the family descriptions.

Date	Topic
10/30	*Lecture*: Gas bladder & buoyancy (Helfman, pp. 50-52, 68-70); **Fieldtrip Assignment due**
11/1	*Lecture*: Buoyancy & locomotion (Helfman, pp. 113-116) *Lab*: **Lab Quiz 6**; Fish identification (Percidae, Sciaenidae, Gobiidae)
11/6	*Lecture*: **Exam 2**
11/8	*Lecture*: Auditory, mechanosensory & electrosensory systems (Helfman, Ch. 6) *Lab*: **Lab Quiz 7**; Review for Fish Identification Exam; **Paper Discussion 5**—Fish hatcheries (Trushenski et al. 2018)
11/13	*Lecture*: Auditory, mechanosensory & electrosensory systems (cont.); Fish reproduction (Helfman, Ch. 21)
11/15	*Lecture*: Fisheries management; quantifying age & growth (Helfman, pp. 157-161) *Lab*: **Fish Identification Exam**
11/20	*Lecture*: Estimating population parameters
11/22	*Thanksgiving recess!*
11/27	*Lecture*: Estimating population parameters (cont.)
11/29	*Lecture*: Managing fisheries with regulations; **Reference Set due** *Lab*: Estimating population parameters
12/4	*Lecture*: **Quiz 3**
12/6	*Lecture*: Great Lakes Ecology *Lab*: Review for Final Exam; **Paper Discussion 6**—Great Lakes ecology (DeBruyne et al. 2017)
12/12 Wed.	**Final Exam** 12:00 – 1:50 PM

Discussion Papers: Papers downloaded electronically from the library's homepage (www.gvsu.edu/library/); click on "Course Reserve."

Bett, N.N., S.G. Hinch, A.H. Dittman, and S.-S. Yun. 2016. Evidence of olfactory imprinting at an early life stage in Pink Salmon (*Oncorhynchus gorbuscha*). Scientific Reports 6:36393.

DeBruyne, R.L., D.G. Fielder, E.F. Roseman, and P.H. Butchko. 2017. Exploring potential effects of cormorant predation on the fish community of Saginaw Bay, Lake Huron. Journal of Great Lakes Research 43:387-393.

Ferretti, F., S. Jorgensen, T.K. Chapple, G. De Leo, and F. Micheli. 2015. Reconciling predator conservation with public safety. Frontiers in Ecology and the Environment 13(8):412-417.

Fitzgerald, D.B., M. Tobler, and K.O. Winemiller. 2016. From richer to poorer: successful invasion by freshwater fishes depends on species richness of donor and recipient basins. Global Change Biology 22:2440-2450.

Hamel, M.J., M.T. Porath, and L. Pierce. 2018. Young professional survey results: member and nonmember perspectives on decisions to join the American Fisheries Society. Fisheries 43(6):271-277.

Trushenski, J.T., G.E. Whelan, and J.D. Bowker. 2018. Why keep hatcheries? Weighing the economic costs and value of fish production for public use and public trust purposes. Fisheries 43(6):284-293.

Other Readings: These papers will supplement lectures and available electronically from the library's home page or Blackboard.

Hinterthuer, A. 2012. The explosive spread of Asian carp. Bioscience 62:220-224.
Kerr, S.J., C.S. Brousseau, and M. Muschett. 2005. Invasive aquatic species in Ontario: a review and analysis of potential pathways for introduction. Fisheries 30(7):21-30.
Latta, W.C. 2006. The early history of fisheries management in Michigan. Fisheries 31(5):230-234.
Simberloff, D. 2007. Book Review: S. Elmendorf, J. Byrnes, A. Wright, S. Olyarnik, R. Fisher, L. Chamberlin, Fear and Fishing in Lake Davis (DVD). Biological Invasions 9:227-228.

Grading & Evaluation: Grades will be calculated as a percentage of the total points possible (e.g., 93-100% = A, 90-92.9% = A-, 88-89.9% = B+, 82-87.9% = B, 80-81.9% = B-, etc). As a general policy, grades on all work are considered final (i.e., they will NOT be changed) 2 weeks after the work is returned to the student.

Lecture		Lab	
Quiz 1	10	Participation in Sampling Fieldtrips	15
Quiz 2	25	Fieldtrip Assignment	25
Quiz 3	25	Participation in Discussion	30
Exam 1	100	Discussion questions	30
Exam 2 (comprehensive)	100	Lab Quizzes	40
Final Exam (comprehensive)	100	Population Parameters Assignment	25
Reference-set topic	10	Fish identification exam	100
Reference set	60		
Total	**430**	**Total**	**265**

CLASS TOTAL: 695

Reference Set—Students are required to compile an annotated bibliography that contains 15 references from the primary literature (i.e., peer-reviewed journal articles) on a topic that relates to fisheries biology. The assignment should be typed, single spaced, and have 1-inch margins. References should follow the EXACT format used by *Transactions of the American Fisheries Society*. You will be penalized if you do not follow the appropriate format! For each reference, the purpose of the article should be stated in one sentence and another sentence should summarize its main findings as it relates to your topic. Additionally, write a 1-page essay (double spaced) summarizing what you learned and how it pertains to class. Your topic and three references (with annotations) are due on October 16 (2 pts. title, 2 pts./reference, & 2 pts. format). Your complete *Reference Set* is due November 29 (2 pts. title, 1 pt./reference, 1 pt./annotation, 8 pts. format, 10 pts. writing, & 10 pts. essay). Late assignments will be penalized 5 points/day!

Lab quizzes—The goal is for students to become proficient at identifying Great Lakes fishes and prepare for the *fish identification exam*. Lab quizzes 1 & 3 will test a student's ability to use a taxonomic key (i.e., Hubbs et al.) and be open book, whereas lab quizzes 2 & 4-7 will test a student's ability to identify fishes from memory (i.e., closed book). Students will be required to learn the family name, common name, and scientific name of each species. Students are

encouraged to bring a notebook to lab (including field trips) to keep track of the species they observed and record distinguishing characteristics for each species.

Participation in Sampling Fieldtrips—Students are expected to attend all fieldtrips. Participation will be evaluated based on your involvement with sampling and identifying fishes. Attendance is mandatory.

Fieldtrip Assignment—Students are required to compile a species list with photographs for the fishes encountered during fieldtrips. For each species, students should take a photograph of a representative specimen. The assignment should include the family, common, and scientific names for each species accompanied with a photograph; when, where, and how the species was captured; and at least two distinguishing characteristics for identifying the species. You are allowed to share photographs, but each student is expected to complete their own assignment! I suggest completing your assignment in Microsoft PowerPoint. This assignment is due October 30; late assignments will be penalized 5 points/day!

Discussion Questions—Students will be given a set of questions to answer regarding a discussion paper to facilitate critical thinking. Answers must be typed and turned in the day of the discussion. Good writing will be rewarded, and late assignments will NOT be accepted. The discussion questions will be posted on blackboard.

Participation in Discussions—Students will be expected to participate in paper discussions. Participation will be evaluated based on the quantity/quality of comments. Reading assigned papers prior to discussion is required, and attendance at paper discussions is mandatory.

Extra Credit—Exams and quizzes will periodically have extra credit questions. Additionally, each student may earn 5 points of extra credit by sharing with the class a recent news report or journal publication that has relevance to the course. Students will have an opportunity to share a "headline" at the beginning of each lecture. Each student can share one "headline" per lecture. If more than one student reports on the same "headline," then extra credit will only be awarded to the first student to report on the "headline." Students are expected to provide documentation of their "headline" (e.g., copy of article). The instructor will determine the relevance of each "headline" and whether extra credit is awarded.

Attendance: Students should contact the instructor prior to missing a fieldtrip, paper discussion, quiz, or exam. Absences will be excused only under extreme circumstances (e.g., illness), and students may be asked to provide documentation for an absence to be excused.

Special Needs: Any student who requires accommodation because of a physical or learning disability should contact Disability Support Resources (www.gvsu.edu/dsr) at 616-331-2490 as soon as possible. After the student has documented their disability, please make an appointment or see the instructor during office hours to discuss the student's specific needs.

Emergency Information: Immediately proceed to the nearest exit during a fire alarm. Do NOT use elevators. Additional emergency information is available at www.gvsu.edu/emergency.

Policies & Academic Integrity: This course is subject to the GVSU policies listed at www.gvsu.edu/coursepolicies/. Students are expected to follow GVSU's Student Code (www.gvsu.edu/studentcode/).