Biology 4212 Biology of Fishes
Course syllabus
Winter term 2022

TEXTS: 1. Essential Fish Biology: Diversity, structure and function. Derek & Margaret Burton. Oxford University Press. ISBN: 978-0-19-878556-9
2. ROM Keys to The Identification of Ontario Freshwater Fishes. Erling Holm. Royal Ontario Museum.

Lab Manual: Modules provided in the Lab Content Tab of D2L. *The ROM field guide is required for the Fish identification component of labs and available through the Lakehead Bookstore.*

INSTRUCTORS: Dr. Mike Rennie
office: CB 4050
phone: 346-7860
email: mrennie@lakeheadu.ca
Office hours: 1-2 pm Fridays

LAB INSTRUCTORS: Dan Brazeau
Office: CB 3020
Email: dbrazeau@lakeheadu.ca
Office hours: By appointment

Teaching Assistant Haley MacLeod
Office: FB 1018
email: hmacleo1@lakeheadu.ca
Office hours: By appointment

LECTURES: 10 Jan- 23 Jan: Online via Zoom: (on course website- go to other tools > zoom > choose appropriate date)
After 24 Jan: Mon & Wed – 1:00 – 2:30 pm AT 1010

LAB: 10-23 Jan: Online via Zoom: (navigate to same spot as for lectures)
After 24 Jan: Mon 8:30-11:30 am – CB 3015

EVALUATION:

Lecture Midterm	= 20%
Lecture Final	= 20%
Student Fish ID presentations	= 5%
Dissection report	= 10%
Lab exam	= 10%
Written Assignment	= 25%
Data management assignment	= 5%
Fisheries management (Excel Assignment)	= 5%

Last date for withdrawal without academic penalty: Friday 11 March 2022

COURSE OBJECTIVES:

Lectures

Fishes represent the largest and most diverse group of vertebrates. This upper-level course will provide an overview of the diversity and biology of fishes. Lecture material will cover the systematics, evolution, anatomy, biology, and ecology of fishes. Additional topics will include fish behaviour, fisheries techniques, including various aspects of stock assessment and conservation.

Labs in the first half of the course will examine the morphology, classification, and identification of fishes. In the lab you will examine live and preserved specimens, and will be expected to recognize specific structures and understand the function(s) they serve, how they may differ among groups, and how those structures may serve to define taxonomic groups. At the conclusion of the course you should be able to recognize species of the major fish taxa in Northwestern Ontario, understand how they survive and persist in their environment and, hopefully, have an appreciation of the great array of fish diversity.

The second half of the course will focus on data collection and scientific writing with an emphasis on fisheries management, including the exploration, analysis and interpretation of growth rates from fisheries data, methods in population estimation and stock recruitment models. Rather than conducting experiments and reports on live fish, given the limitations of the COVID-19 pandemic, we will utilize both specimens and information for fishes that are readily available at local supermarkets.

Course Policies

Exams: Missed exams will receive a grade of zero unless you are absent for a documented valid reason such as a family or medical emergency. If you wish to have an exam regraded you must submit a written explanation of why you think the assigned grade was incorrect within 2 weeks of return of the exam. Be aware the entire exam will be re-evaluated and your mark may go up, remain the same, or go down. **Note**: this does not apply to arithmetic errors such as incorrect addition. You may bring these types of errors to my attention for correction, without a written explanation, at any time.

Written Assignments

Written assignments submitted late will be penalized 10% per day except for a documented valid reason such as a family or medical emergency. Papers will not be graded in the absence of a completed and signed form indicating the understanding of plagiarism in its many forms. **This will require the completion of an online exercise and quiz relating to plagiarism.** Additional direction regarding topics and format will be provided in class.

Academic Dishonesty

(The following is taken directly from the University website, with minor modification)

The University takes a most serious view of offences against academic honesty. Penalties for dealing with such offences will be strictly enforced.

The following rules shall govern the treatment of candidates who have been found guilty of attempting to obtain academic credit dishonestly.

(a) ***The minimum penalty*** for a candidate found guilty of plagiarism, or of cheating on any part of a course will be a zero for the work concerned.
(b) A candidate found guilty of cheating on a formal examination or a test, or of serious or repeated plagiarism, or of unofficially obtaining a copy of an examination paper before the examination is scheduled to be written, ***will receive zero for the course and may be expelled from the University.***
A copy of the "Code of Student Behaviour and Disciplinary Procedures" may be obtained from the Office of the Registrar.

Proposed Schedule (subject to change):

Lecture or Lab	**Date**	**Topic**	**Recommended readings**
Lab	**Jan 10**	**NO LAB**	
Lecture 1	Jan 10	What is a fish/basic anatomy and phylogeny	Burton Chapter 1, Appendix 15.1, Chapter 13
Lecture 2	Jan 12	Phylogeny continued; Hagfish and lampreys, Evolution of jaws, Elasmobranchs; Teleosts, Coelacanth, Dipnoi: lungfish, Actinopterygii: sturgeons, paddlefish	Burton Chapter 1
Lab	**Jan 17**	**Introductory Lab and Dissection Lab 1**	
Lecture 3	Jan 17	Teleostei, phylogenetic trends: Osteoglossomorpha, Elopomorpha, Otocephalomorpha, Euteleostei	Burton Chapter 1
Lecture 4	Jan 19	Anatomy: Skeletal, appendicular, scales, musculature, gas bladder Locomotion: aquatic habitat, drag, thrust, propulsion, fin aspect ratio, control, schooling	Burton Chapter 2, 3
Lab	**Jan 24**	**Fish Dissection Lab 2**	
Lecture 5	Jan 24	Feeding: jaws, pharyngeal jaws, dentition, mouth position, digestion	Burton Chapter 4
Lecture 6	Jan 26	Circulatory transport and gas exchange; Respiration: gill structure, gill function, ventilation, air breathing	Burton Ch. 5, 6
Lab	**Jan 31**	**Fish ID Part 1: Using a key**	
Lecture 7	Jan 31	Metabolism and homeostasis; excretion and osmoregulation	Burton Ch. 7, 8
Lecture 8	Feb 2	Metabolism and excretion continued	Burton Ch. 7, 8
Lab	**Feb 7**	**Fish ID Part 2: More fish ID**	
Lecture 9	Feb 7	Reproduction	Burton Ch. 9

Lecture or Lab	Date	Topic	Recommended readings
Lecture 10	Feb 9	Hormones and the nervous system	Burton Ch. 10, 11
Lab	**Feb 14**	**Fish ID Part 3: Student presentations**	
Lecture 11	Feb 14	Perception and sensation: photoreception, mechanoreception, (sound, lateral line), equilibrium and balance, chemoreception (smell, taste), electroreception, magnetic reception	Burton Ch. 12
MIDTERM	**Feb 16**	**Midterm exam**	
Reading break	***Feb 15-25***		
Lab	**Feb 28**	**Lab Midterm**	
Lecture 12	Feb 28	Fisheries management overview	
Lecture 13	Mar 2	Age and growth (start abundance if we can)	Burton Ch. 16
Lab	**Mar 7**	**Age and abundance lab / final assignment overview/project discussion/ troubleshooting data**	
Lecture 14	Mar 7	Estimating abundance, production	
Lecture 15	Mar 9	Mortality and survival	
Lab	**Mar 14**	**Mortality and production lab (Haley) /project discussion/ troubleshooting data**	
Lecture 16	Mar 14	Guest lecture: Dr. Rob Mackereth, Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry	
Lecture 17	Mar 16	Effort, MSY and sustainable yield (Haley MacLeod)	
Lab	**Mar 21**	**Ageing lab (NDMNRF, Paul Drombolis)**	
Lecture 18	Mar 21	Stock-recruitment	
Lecture 19	Mar 23	Guest Lecture: Dr. Connie O'Connor, Wildlife Conservation Society of Canada	
Lab	**Mar 28**	**Open lab- get help with your project**	
Lecture 20	Mar 28	Physiology and energetics in fisheries research	
Lecture 21	Mar 30	Feeding ecology, diet	
Lab	**Apr 4**	**Lab- fisheries analysis (computer-based; applying concepts from lecture)**	
Lecture 22	Apr 4	Mating, behaviour	Burton Chapter 9, Section 14.8, 13.12…
Lecture 23	Apr 6	Locomotion, migration	Burton Ch. 14
Final exam	**Apr 12**	**Room AT 2019, 1:00 pm**	