

**Biology 4212WA Biology of Fishes**  
**Course syllabus**  
**Winter term 2019**

**TEXTS:** Essential Fish Biology: Diversity, structure and function. Derek & Margaret Burton. Oxford University Press. ISBN: 978-0-19-878556-9

Fish Ecology. R.J. Wootton. Springer Science+Business Media, DV. ISBN 978-0-7514-0306-0.

**Lab Manual:** Handouts through the course TBA.

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**LECTURES:** Tues & Thurs – 10:00 – 11:30 pm – AT 1006

**LAB:** Mon 2:30-5:30 – CB 3013

<b>EVALUATION:</b>	Lecture Midterm	= 20%
	Lecture Final	= 30%
	Lab Midterm	= 20%
	Dissection Report	= 8%
	BAF Quiz	= 2%
	Swordtail Behaviour Assignment	= 10%
	Stock recruitment/ Excel Assignment	= 10%

<b>GRADES:</b>	A+ $\geq$ 90
	A = 80 – 89 (1 <sup>st</sup> class standing)
	B = 70 – 79
	C = 60 – 69
	D = 50 – 59
	E = 40 – 49 (failed)
	F = 1 – 39 (failed)
	F Academic Dishonesty = 0

**Withdrawal without academic penalty:** Friday 8 March 2019

## **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 entail a few activities involving live fish. One of these labs will be an experiment evaluating the mating behaviours of swordtail fishes, requiring detailed observations and analyses of the data collected, which will result in a lab report describing the results of the experiment. Additionally, we will visit the Dorion fish hatchery to see a large-scale production facility in action. Additional labs will be computer or lab-based, emphasizing approaches to understanding and analyzing fisheries data, including the exploration, analysis and

interpretation of growth rates from fisheries data, methods in population estimation and stock recruitment models.

### **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):**

<b>Lecture or Lab</b>	<b>Date</b>	<b>Topic</b>	<b>Recommended readings</b>
<b>Lab</b>	<b>Jan 7</b>	<b>NO LAB</b>	
Lecture 1	Jan 8	What is a fish/basic anatomy and phylogeny	Burton Chapter 1, Appendix 15.1, Chapter 13; Wootton Chapter 1
Lecture 2	Jan 10	Phylogeny continued; Hagfish and lampreys, Evolution of jaws, Elasmobranchs; Teleosts, Coelacanth, Dipnoi: lungfish, Actinopterygii: sturgeons, paddlefish	Burton Chapter 1, Wootton section 1.3
<b>Lab</b>	<b>Jan 14</b>	<b>Lamprey dissection</b>	
Lecture 3	Jan 15	Teleostei, phylogenetic trends: Osteoglossomorpha, Elopomorpha, Otocephalomorpha, Euteleostei	Burton Chapter 1, Wootton section 1.3
Lecture 4	Jan 17 Unplugged	Anatomy: Skeletal, appendicular, scales, musculature, gas bladder Locomotion: aquatic habitat, drag, thrust, propulsion, fin aspect ratio, control, schooling	Burton Chapter 2, 3
<b>Lab</b>	<b>Jan 21</b>	<b>Shark dissection/ Herring dissection</b>	
Lecture 5	Jan 22	Feeding: jaws, pharyngeal jaws, dentition, mouth position, digestion	Burton Chapter 4
Lecture 6	Jan 24 Unplugged	Circulatory transport and gas exchange; Respiration: gill structure, gill function, ventilation, air breathing	Burton Ch. 5, 6

<b>Lecture or Lab</b>	<b>Date</b>	<b>Topic</b>	<b>Recommended readings</b>
<b>Lab</b>	<b>Jan 28</b>	<b>Fish ID part 1- Family level</b>	
Lecture 7	Jan 29	Metabolism and homeostasis; excretion and osmoregulation	Burton Ch. 7, 8
Lecture 8	Jan 31	Metabolism and excretion continued	Burton Ch. 7, 8
<b>Lab</b>	<b>Feb 4</b>	<b>Fish ID part 2- Species level</b>	
Lecture 9	Feb 5	Reproduction	Burton Ch. 9
Lecture 10	Feb 7	Hormones and the nervous system	Burton Ch. 10, 11
<b>Lab</b>	<b>Feb 11</b>	<b>Fish ID part 3- Cyprinidae, Darters and other challenging taxa</b>	
Lecture 11	Feb 12	Perception and sensation: photoreception, mechanoreception, (sound, lateral line), equilibrium and balance, chemoreception (smell, taste), electroreception, magnetic reception	Burton Ch. 12
MIDTERM	Feb 14	Midterm exam	
<b>Reading break</b>	<b>Feb 18-22</b>		
<b>Lab</b>	<b>Feb 25</b>	<b>Lab exam</b>	
Lecture 12	Feb 26	Fisheries management overview	Wootton Chapters 1, 2
Lecture 13	Feb 28	Mating, behaviour	Burton Chapter 9, Section 14.8, 13.12; Wootton 6.1-6.6
<b>Lab</b>	<b>Mar 4</b>	<b>BAF- swordtail behaviour</b>	
Lecture 14	Mar 5	Locomotion, migration	Wootton Chapter 4; Burton Ch. 14

<b>Lecture or Lab</b>	<b>Date</b>	<b>Topic</b>	<b>Recommended readings</b>
Lecture 15	Mar 7	Fisheries Conservation (guest lecture, Constance O'Connor, Wildlife Conservation Society of Canada)	Burton Ch. 16
<b>Lab</b>	<b>Mar 11</b>	<b>Data analysis, Excel 101 (computer lab)</b>	
Lecture 16	Mar 12	Age and growth	Wootton section 5.11, Chapter 6
Lecture 17	Mar 14	Estimating abundance	*
<b>Lab</b>	<b>Mar 18</b>	<b>Dorion hatchery visit?</b>	
Lecture 18	Mar 19	Mortality and survival	Wootton Chapter 6*
Lecture 19	Mar 21	Feeding ecology, diet	Wootton Chapter 3, Sections 5.1 to 5.10
<b>Lab</b>	<b>Mar 25</b>	<b>Ageing lab (MNR)</b>	
Lecture 20	Mar 26	Physiology and energetics	Wootton Chapter 4
Lecture 21	Mar 28	Guest lecture (Brian Shuter, Ontario MNR); Climate change and fisheries	
<b>Lab</b>	<b>Apr 1</b>	<b>Lab- fisheries analysis (computer lab)</b>	
Lecture 22	Apr 2	Stock-recruitment	Wootton Chapter 6*
Lecture 23	Apr 4	Effort, MSY and sustainable yield	Wootton Chapter 6*
Final exam	TBA		

\*Lectures will rely heavily on class notes, but recommended readings will help provide context.