



## ZOO\*4330 Biology of Fishes

Winter 2020

Section(s): C01

Department of Integrative Biology

Credit Weight: 0.50

Version 3.00 - January 02, 2020

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### 1 Course Details

#### 1.1 Calendar Description

This course provides a comparative examination of selected freshwater and marine fishes to illustrate the influence of aquatic environments on life styles, behavioral patterns, physiological responses, population biology and community structure. The use of niche, habitat and ecotope concepts in defining the role of fishes in representative types of aquatic ecosystems will be examined.

**Pre-Requisites:** 15.00 credits including (STAT\*2040 or STAT\*2230), ZOO\*2090

#### 1.2 Course Description

This course also provides a practical experience in the study of fishes. Using University collections of prepared and preserved specimens, students will develop and apply skills in identification and sampling, explore relations between species diversity and habitat, and investigate, through guided study, the extent of anatomical, skeletal, reproductive and morphological variation and its functional and evolutionary causes.

#### 1.3 Timetable

- Lectures: Monday & Wednesday, 12:30pm-1:20pm, location CRSC Rm 117
- Labs:
  - Wednesdays, 2:30-5:20 PM, SSC 2303
  - Thursdays, 2:30-5:20 PM, SSC 2303

#### 1.4 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

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## 2 Instructional Support

### 2.1 Instructional Support Team

<b>Instructor:</b>	Dr. Nick Bernier
<b>Email:</b>	nbernier@uoguelph.ca
<b>Telephone:</b>	519-824-4120 x56093
<b>Office:</b>	SSC 3467
<b>Office Hours:</b>	TBA
<b>Lab Co-ordinator:</b>	Dori McCombe
<b>Email:</b>	dori.mccombe@uoguelph.ca
<b>Telephone:</b>	+1-519-824-4120 x58379
<b>Office:</b>	SSC 1444
<b>Office Hours:</b>	By appointment

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## 3 Learning Resources

### 3.1 Required Resources

#### **Biology of Fishes Lab Manual (Lab Manual)**

Balon, E.K., D.L.G. Noakes, R. Danzmann, m.T. Rush-Smyth & D. McCombe. Biology of Fishes Laboratory Manual. 2018. Editor: Dori McCombe. Department of Integrative Biology, College of Biological Science, University of Guelph, Guelph, Ontario, Canada.

#### **Courselink (Website)**

<https://courselink.uoguelph.ca>

- This course will make use of the University of Guelph's course website on D2L (via CourseLink).
- Consequently, you are responsible for all information posted on the CourseLink page for ZOO\*4330. Please check it regularly.
- Lecture outlines will be posted before a lecture. They should not be treated as a substitute for the lectures; instead, they should be used to help you prepare for lectures and should be augmented with careful lecture notes.

#### **Lab Equipment (Equipment)**

Students will be responsible for providing their own dissection instruments, rulers, pencils, and laboratory notebooks.

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## 4 Learning Outcomes

## 4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Have an increased understanding of the evolutionary origins of the major fish taxonomic Classes, with emphasis on the bony fishes (lecture)
  2. Have a greater understanding of the genetic and environmental factors regulating reproduction in fishes (lecture)
  3. Gain an understanding of the various 'modes' of reproduction in fishes (lecture)
  4. Have knowledge of how abiotic factors influence adaptive capabilities in fishes (lecture)
  5. Have greater insight into how growth is regulated in fishes (lecture)
  6. Gain a heightened understanding of the various sensory modalities in fishes and how these anatomical and physiological adaptations interact in the social development of fishes (lecture)
  7. Understand how the mechanisms discussed in point 6 above are influential in the speciation processes in fishes (lecture)
  8. Students will develop meristic and mensural skills used to study the various aspects of fish biology (lab)
  9. Through laboratory studies, students will apply methods of sampling fish diversity, and will relate diversity to habitat variables (lab)
  10. Laboratory studies will allow students to develop a thorough understanding of fish anatomy, to explore variation in morphology among different groups of fishes and to test hypotheses regarding their function and evolution (lab)
  11. Taxonomy exercises will allow students to become proficient in the use of dichotomous keys to assign fishes to taxonomic categories and North American specimens to Order, Family, and Species (lab)
  12. Using class and individual data sets, students will hone their analytical-statistical skills as well as their writing skills (lab)
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## 5 Teaching and Learning Activities

### 5.1 Course Structure

<b>Week of</b>	<b>Lectures</b>	<b>Laboratories</b>
Jan. 6	Introduction; Structural Diversity	
Jan. 13	Comparative Osteology of Eating and	Lab 1: Structural Diversity of Fishes

	Locomotion	
Jan. 20	Evolution & Diversity	Lab 2: Comparative Osteology / Form & Function
Jan. 27	Evolution & Diversity; Life-history	Lab 3: Parade of Orders
Feb. 3	Reproduction; Sex Determination; Sexual Differentiation; Sex Reversal	Lab 4: Meristics & Morphometrics
Feb. 10	Longevity & Aging; Midterm	Lab 5: Ontogenetic Features and Reproductive Strategies
Feb. 17	(Winter break)	(Winter break)
Feb. 24	Social Behaviour & Learning	Lab 6: Quantification of Developmental Asymmetry
Mar. 2	Sensory Modalities	Lab 7: Freshwater Fishes Identification
Mar. 9	The Osmorespiratory Compromise	Lab 8: Marine Fishes Identification
Mar. 16	Abiotic Factors & Metabolic Rate	Lab 9: Schooling Behaviour
Mar. 23	Regulation of Growth	Open Lab for Review
Mar. 30	Climate Change and Performance	Final Lab Evaluation

## 5.2 Lectures

Recommended readings will supplement the faculty lectures. There is no required textbook for this course. Students will be given opportunity and encouraged during lectures and laboratories to discuss questions arising from lectures and related readings. Students who miss lectures for any reason are responsible for the material covered.

## 5.3 Laboratories

Laboratory instructions will be provided online, and during *prelab* talks. You will need a copy of the manual: *ZOO\*4330 Biology of Fishes Lab Manual*. This lab manual will be made available to you the first week of classes by the Department of Integrative Biology.

Information will be posted on *CourseLink* concerning dates and times for purchasing the manual. Students will be responsible for providing their own dissection instruments, rulers, pencils, and laboratory notebooks. Laboratory exercises will include demonstrations of specimens and techniques, various audiovisual materials, and regular experimental and/or instructional activities by students.

## 5.4 Important Dates

- Jan. 6 (Mon): First lecture in ZOO\*4330, 12:30 pm
- Jan. 15-16 (Wed & Thurs): First lab in ZOO\*4330, 2:30 pm
- Jan 31 (Fri): Writing Assignment Deadline – 11:59 pm
- Feb. 12 (Wed): Midterm
- Feb. 17-21 (Mon – Fri): **Winter break: NO CLASSES**
- Feb. 28 (Fri): Lab report 1 Deadline – 11:59 pm
- Mar. 27 (Fri): Lab report 2 Deadline – 11:59 pm
- April 1-2 (Wed & Thurs): Final Lab Evaluation
- April 3 (Fri): Last day to drop course; classes conclude
- Final exam: TBA

## 6 Assessments

Students will be held responsible for all materials given in lectures, laboratory classes, and as specific reading assignments unless otherwise stated. No unofficial deferments of any scheduled evaluation will be given. Students who miss the midterm or other assessment components for documented medical or other legitimate reasons will have their final marks pro-rated on the basis of completed evaluations. No make-up evaluations will be conducted. The final lab evaluation (exam) and the final exam must be completed in order to pass the course.

### 6.1 Assessment Details

#### Writing Assignment (10%)

**Due:** Fri, Jan 31 - , 11:59 PM, Courselink Dropbox

#### Laboratory Report 1 (10%)

**Due:** Fri, Feb 28 - , 11:59 PM, Courselink Dropbox

#### Laboratory Report 2 (10%)

**Due:** Fri, Mar 27 - , 11:59 PM, Courselink Dropbox

#### Final Lab Evaluation (20%)

The laboratory practical evaluation will be given during your regular laboratory session, either April 1<sup>st</sup> or 2<sup>nd</sup>. The format will be of a station-to-station bell-ringer question/identification/ type. This assessment will not tend to favour simple regurgitation of factual material, but a course of this nature must of necessity involve the assimilation of a considerable body of factual information.

**Midterm Test (15%)**

The midterm test will be a written test of about 45 minutes duration and will be held in class, February 12<sup>th</sup>. The test will include all the material presented in class up to the preceding lecture period. The results from the midterm will constitute 15% of your final mark and will consist primarily of short answer type questions. Synthesis of concepts, rather than straight regurgitation of facts will be emphasized.

**Final (cumulative) (35%)**

The final exam will be a written, two hour exam held during the exam period, t.b.a. The exam will consist of definitions and short-answers based on all of the content covered in the course. You will be assessed on your ability to evaluate the information and interpret it in light of the studies you have examined in the lecture.

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## 7 Course Statements

### 7.1 Student's Responsibility

It is incumbent on the student to inform the instructors of the course within the first two weeks of class if there is a conflict between a student's religious observations (Holy Days) and a scheduled lab component, or lecture / lab evaluations.

### 7.2 Appropriate Use of Conferences

- This course has been designed to foster interaction between students and with the instructors. The conferences provide a means for course members to share ideas, opinions, and resources. The use of these computer conferences is a privilege, not a right, which may be revoked at any time for abusive conduct.
- Please show respect for the opinions of others at all times, even if you do not agree with their ideas. We encourage you to disagree, critique and add new insights, but this must be done in a positive manner. Discussions in the online conferences must be treated the same as face to face discussion. In the conferences others cannot see such things as facial expression and body language, both of which we normally take into account when talking face to face with someone. Therefore, be very careful in the phrasing of your contributions and responses, as they may be interpreted differently than what you had intended. Please respect your fellow students. You **MUST NOT** post racist, sexist, homophobic, or other similar remarks that are likely to cause offence. Please keep in mind that the conferences are public places. Anyone with access to the course website has the capability of seeing conference postings.

### 7.3 Assignment of Grades

- Work in this course is evaluated according to the University of Guelph grading

standards. For a definition of the numerical grades you receive please see Resolution 1 in the section on Grading Procedures under Grades in VIII: Undergraduate Degree Regulations and Procedures in the University of Guelph 2017-2018 Undergraduate Calendar.

See Resolution 1 under 'Grading Procedures' in the Undergraduate Calendar for a description of grading standards used at the University of Guelph:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-grds-proc.shtml>

- Grading rubrics will be used to illustrate the specific grading criteria used to evaluate the lab reports. These are available on *CourseLink*.
- You may check your grades at any time during the semester through the Grades page on the course website.

## 7.4 Late Policy

Work that is handed in late will be penalized 10% for each 24 hour period. If you encounter technical problems when submitting your writing assignments, please email the assignment to the Lab Coordinator in advance of the deadline to avoid late penalties.

## 7.5 Academic Consideration

- If you are absent from class during the semester, you will be expected to make up missed lecture and laboratory material on your own.
- If you are unable to complete any of the writing assignments by the deadline for documented medical, psychological, or compassionate reasons, please contact the Lab Coordinator in advance of the deadline to make arrangements for a short extension.

## 7.6 Academic Integrity

Although we do encourage you to share thoughts and ideas while studying for the course, all material submitted for grading **MUST BE YOUR OWN** work! The University takes a serious view of academic misconduct, including plagiarism. The penalties for academic misconduct are severe and can lead to expulsion from the University and the revocation/rescinding of a degree.

## 7.7 Pedagogical Values

- This course aims to support the mission statement and the learning objectives set out by the University of Guelph in the Undergraduate Calendar. This means that this course will be research intensive and learner-centered. Ultimately we want students to be capable of self-assessment, critical inquiry, and active learning.

Read the University of Guelph 'Mission Statement' in the Undergraduate

Calendar:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c02/index.shtml>

Read the University of Guelph 'Learning Outcomes' in the Undergraduate

Calendar: <https://www.uoguelph.ca/registrar/calendars/undergraduate/2016-2017/outcomes/>

## 7.8 Teaching Philosophy

In support of the University Mission statement, we will adopt a learner-centered approach to teaching. In this course, that means that instructors are not the only ones responsible for depositing knowledge into the minds of students. Instead, you are expected to take an active role in your own learning. The teaching team will provide opportunities for you to learn independently and from one another, and will coach you in the skills needed to do so effectively. The lecture component provides the required content material for your understanding and enables you to build upon this knowledge. Metaphorically speaking, the lab instructor and teaching assistant will not be “the sage on the stage” but rather “the guide on the side”, because research shows this method can lead to an increased motivation to learn, greater retention of knowledge and a deeper understanding of the material.

## 7.9 Teaching Team's Role and Responsibility to Students

In this course you can expect your instructors to...

- Clearly define the course learning objectives
- Provide well articulated activities that enhance learning
- Ensure timely and fair grading procedures
- Notify you of events, deadlines, announcements concerning grades, and other official information
- Provide and adhere to well defined policies and procedures as described in the course outline, and the Undergraduate Calendar
- Provide assistance, when asked, if you are having difficulties in the course
- Foster and uphold an environment of academic integrity and a love of learning

## 7.10 Student's Learning Responsibilities

Your success in this course depends on your response to the opportunities this course offers you. As a student in this course, you are responsible for...

- Knowing the course learning objectives as covered in the lecture and lab components each week.
- Prepare for, attend, and review your lecture and lab components.
- Contact your professor if you have any difficulties with the course.
- Completing all required lecture and lab objectives and assignments.
- Reading the assigned resources on the course website and through e-reserve.



- Reading all announcements and other class material distributed in class or on-line.
- Accessing the *CourseLink* regularly for important communications from the course instructors or teaching assistants.
- Understanding and adhering to policies and procedures as described in the course outline, and the Undergraduate Calendar.
- Understanding grading procedures.
- Familiarizing yourself with the course schedule of dates with particular attention to deadlines.
- Initiating action, in advance of due dates, by consulting your instructor or program counsellor if extenuating circumstances affect your academic performance.
- Understanding what constitutes academic misconduct and refraining from it.

### 7.11 Plagiarism Detection Software

Electronically submitted student assignments are automatically compared to other electronic documents (including online and student papers) by Turnitin™ for degree of similarity.

### 7.12 Technical Requirements

- The course web site provides the connection between you and your fellow classmates. When collaborating on class data, it is essential that you are able to connect properly to our course in *CourseLink*. For adequate interaction with the course web site please make sure that your computer meets the minimum requirements.

See the recommended 'System Requirements' or use with *CourseLink*:

<http://www.uoguelph.ca/courselink/systemRequirements.html>

- If you do not have these technical requirements, consider either upgrading your personal computer, or using a machine on-campus. Trying to use someone else's computer for the course may prove to be frustrating and difficult.
- Please follow this quick System Check to determine if you have the right setup. (Results will be displayed in a new browser window).
- Do a 'System Check' to make sure that your computer is configured properly for this course: <https://courselink.uoguelph.ca/d2l/systemCheck>

### 7.13 Course Evaluation

- Course Evaluation information (from the CCS website)  
CCS now provides the U of G Online Course Evaluation System in a secure, online environment. End of semester course and instructor evaluations provide students the opportunity to have their comments and opinions form part of the information used by Promotion and Tenure Committees in evaluating the faculty

member's contributions in the area of teaching.

- Course evaluations are now conducted through this web site. Login with your central email account login ID and password:  
[https://courseeval.uoguelph.ca/CEVAL\\_LOGIN.php](https://courseeval.uoguelph.ca/CEVAL_LOGIN.php)
- Occasionally course evaluations are conducted in class.
- Please Note: Instructors do NOT receive evaluations until the end of exam period. Furthermore, evaluations are anonymous, unless you specifically indicate you want to acknowledge your comments.

## 7.14 NOTE

This outline is distributed for information and is available via *CourseLink*. Failure to obtain a copy of this outline in the first instance, or to read and respond accordingly to its contents, are not acceptable grounds for complaints after the first week of classes.

In particular, no changes in the marking, grading or evaluation scheme will be made without the agreement of the professor, lab instructor and the written consent of all students enrolled in the course. There will be no unofficial deferrals of any scheduled evaluation. Students who miss any evaluation for documented medical or other legitimate reasons will have their final grades pro-rated on the basis of completed evaluations. No make-up evaluations will be conducted during the semester. Students who miss laboratories for any reason are responsible for the material covered.

# 8 Department of Integrative Biology Statements

## 8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

## 8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.  
<http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can

be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

## 8.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.  
<https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations.  
<http://www.selfregulationskills.ca/>

## 9 University Statements

### 9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

### 9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

### 9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of

Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

## 9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

## 9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website

<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website

<https://www.ridgetownc.com/services/accessibilityservices.cfm>

## 9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community—faculty, staff, and students—to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an

environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

## 9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## 9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>

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