DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Biology
BIOL/MARI 4080
Laboratory Study of Fishes
Winter 2017

Instructor(s): C. Isabelle Aubé isabelle.aube@dal.ca Office: LSC 2123

Lectures: None (this is a lab-based course)

Laboratories: Twelve 3-hour labs, LSC 2112

Tutorials: None

Course Description
Through a series of laboratory exercises, the course provides students with practical experience on various topics related to the study of ichthyology. Topics shall include the following: species identification; meristics and morphometrics; use of dichotomous keys; internal and external morphology; ageing and growth determination; ecomorphological attributes; data collection and analysis.

Course Prerequisites
Prerequisites: BIOL 3080.03 or MARI 3080.03
Exclusions: BIOL 3067.03, MARI 3067.03, BIOL 5067.03

Course Objectives/Learning Outcomes
After successfully completing this course, the student will have the ability to:

- locate and identify external and internal morphological features of most groups (e.g. superclasses, classes, subclasses) of fish.
- identify, describe, and memorize the Latin binomials, common names, families and orders of fish ranging phylogenetically from Myxiniformes (hagfish) to Salmoniformes (salmons, trouts, and chars) and from Stomiiiformes (hatchetfish and viperfish) to Tetraodontiformes (puffer and tobies).
- measure and record data related to classical meristics and morphometrics of a broad range of fishes.
- use fish dichotomous keys within the scope of a lab period.
- determine the age of several fish using calcified structures and incorporate the age data with data on fish size into a von Bertalanffy growth model as well as calculate life-history invariants.
- measure a number of different life-history variables on previously frozen Atlantic Canadian marine fishes and contribute to a class dataset.
- present background information and results of fish data and statistical analyses of (a) chosen life-history variable(s) as part of a group oral presentation.
- prepare a written manuscript in accordance with the principles of scientific writing that includes descriptive and statistical analyses of (a) chosen life-history variable(s).

DALHOUSIE UNIVERSITY

Required Course Materials

Required:

Cailliet GM, Love MS. 1996. Fishes: A Field and Laboratory Manual on Their Structure, Identification and Natural History. Long Grove (IL): Waveland Press. 194 p.

Recommended:

Barton M. 2007. Bond's Biology of Fishes. 3rd ed. Belmont (CA): Thomson. 891 p.

Course website: BIOL 4080 Laboratory Studies of Fishes (Brightspace link at dal.ca)

Course Assessment

Component	Weight (% of final grade)	Date
Tests/quizzes		
General Fish ID Quiz	*20%*	*Jan 31st, 2017*
Dicotomous Key Quiz	*10%*	*Feb 14th, 2017*
Internal & External Morphology Quiz	*20%*	*Mar 7th, 2017*
Atlantic Fish ID Quiz	*20%*	*April 4th, 2017*
Assignments (submitted in Brightspace Dropbox)		
Modelling Fish Growth Assignment	*5%*	*Mar 21st, 2017 (due end of lab)*
Life-History Research Manuscript	*20%*	*April 10th (due last day of classes)*
Oral Presentation		
Life-History Research Presentation	*5%*	*Mar 28th, 2017 (in-lab)*
Other		
Project for bonus mark	*To be determined (TBD)*	*TBD*

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	**B+** (77-79)	**C+** (65-69)	**D** (50-54)
A (85-89)	**B** (73-76)	**C** (60-64)	**F** (<50)
A- (80-84)	**B-** (70-72)	**C-** (55-59)	

DALHOUSIE UNIVERSITY

Course Policies

- Due to limited availability of fresh, frozen, and preserved fish specimens, students are encouraged to attend all labs. Specimens may be destroyed by the end of the lab; therefore, a makeup lab may not be possible.
- For safety reasons, no food or drink will be allowed in the lab and students must wear closed-toed shoes. Students requiring periodic breaks within the lab period are reminded to wash their hands before leaving the lab.
- All students are required to wash their work surfaces, tools, equipment, work gloves and/or hands with the provided disinfectant and soap before leaving the lab. To minimize the smell of decaying fish, by the end of the lab, all fresh and previously frozen biological specimens must be discarded in a labeled transparent double-bag in the freezer. Highly soiled gloves and paper towels must also be discarded in a separate labeled transparent double-bag in the freezer. Preserved specimens must be discarded according to the in-lab instructions.
- Late arrivals and early departures are discouraged as they can disrupt the flow of the lab and put more setup and breakdown responsibilities on others.
- All assignments are to be submitted in the associated Brightspace Dropbox. A 10% per day (including weekends) deduction will be levied on all late assignments without a reasonable excuse (determined by the instructor on a case-by-case basis). If the student requires an extension due to a reasonable excuse, the student must contact the instructor by email (Isabelle.aube@dal.ca) at the earliest possible time. Documentation for the excuse (e.g. sick note) will not be required.
- If a student misses a quiz or a presentation, the instructor must be contacted by email (Isabelle.aube@dal.ca) at the earliest possible time. A makeup quiz or presentation may be granted with a reasonable excuse (determined by the instructor on a case-by-case basis). Documentation for the excuse (e.g. sick note) will not be required.
- All graded components of this course are valued; therefore, none of the missed work will be prorated. It is the responsibility of the student to contact the instructor by email (Isabelle.aube@dal.ca) at the earliest possible time to make arrangements to complete all quizzes, assignments and presentations in the event of missed labs.
- In the event of a school closure (sign up at https://dalalert.dal.ca/), the lab will be cancelled or rescheduled. More details will be provided on the BIOL 4080 Brightspace page. If labs are cancelled or rescheduled for other reasons, an announcement will be made on the BIOL 4080 Brightspace page.

DALHOUSIE UNIVERSITY

Course Schedule and Content

Week 1 (Jan 10)	**External Morphology**	The purpose of this lab is to familiarize students with the external morphology of fishes. The specimens represent most major groups (e.g., superclasses, classes, subclasses) of fishes and express some of the tremendous diversity characterized by the most speciose group of vertebrates. As with several labs, the specimens examined will have been preserved in 65% ethanol.	
Week 2 (Jan 17)	**Fish Identification I**	The purpose of this lab will be to identify, describe, and memorize the Latin binomials, common names, families and orders of fish specimens ranging phylogenetically from Myxiniformes (hagfish) to Salmoniformes (salmons, trouts, chars).	
Week 3 (Jan 24)	**Fish Identification II**	The purpose of this lab will be to identify, describe, and memorize the Latin binomials, common names, families and orders of fish specimens ranging phylogenetically from Stomiiiformes (hatchetfish, viperfish) to Tetraodontiformes (puffers, tobies).	
Week 4 (Jan 31)	**Fish Identification Assessment and Identification Tools**	The first part of the lab will be comprised of an Identification Quiz to test the species identification knowledge gained by the students thus far. The second half of the lab will comprise an introductory lecture on fish meristic and morphometric variables.	**General Fish ID Quiz (20%)**
Week 5 (Feb 7)	**Meristics and Morphometrics**	The lab will involve the measurement and recording of data related to classical meristic and morphometric characters of a phylogenetically broad range of fishes.	
Week 6 (Feb 14)	**Species Identification and the Use of Dichotomous Keys**	The purpose of this lab will be to introduce students to the process of using dichotomous keys to identify species. At the end of the lab, students will participate in a quiz to test their ability to identify species, using the skills acquired.	**Dicotomous Key Quiz (10%)**
Week 7 (Feb 21)	STUDY BREAK	NO CLASSES	
Week 8 (Feb 28)	**Internal Morphology**	The purpose of this lab is to familiarize students with various aspects of the internal morphology of fishes. The specimens will represent a widely distributed species in Atlantic Canada, such as Atlantic Cod, Haddock, Atlantic Salmon, or Brook Trout. Dissection of fresh or previously frozen specimens will be required.	

Week 9 (Mar 7)	**Quiz on Internal and External Morphology**	During the first part of the lab, students will be tested on their knowledge of fish internal morphology. During the second part of the lab, students will be tested on their knowledge of fish external morphology.	**Internal & External Morphology Quiz (20%)**
Week 10 (Mar 14)	**Life-History Data Measurement and Dataset Construction**	The purpose of this lab will be to measure a number of different variables on fresh or previously frozen Atlantic Canadian marine fishes about which very little information is currently known. The students will measure data on their own and contribute the data to a class dataset. Students will be responsible for preparing a manuscript written in accordance with the principles of scientific writing, that includes descriptive and statistical analyses of these data.	
Week 11 (Mar 21)	**Age Determination and Modelling of Fish Growth**	Students will determine the age of several fish, using calcified structures. In conjunction with data on fish size, the age data will be incorporated into a von Bertalanffy growth model. In addition to modelling growth, students will be responsible for calculating life-history invariants. Students will submit their modelling results for grading.	**Modelling Fish Growth Assignment (5%) (due at end of lab)**
Week 12 (Mar 28)	**Student Presentations on Life-History Research: Data and Analysis**	**Life-History Research Student Presentations (5%)**	
Week 13 (Apr 4)	**Lecture on the Use of Fish Laboratory Skills, Techniques, and Analysis**	**Atlantic Fish ID Quiz (20%)**	
Last day of classes (Apr 10)		**Life-History Research Manuscript Due (20%)**	

DALHOUSIE UNIVERSITY

ACCOMMODATION POLICY FOR STUDENTS

Students may request accommodation as a result of barriers related to disability, religious obligation, or any characteristic protected under Canadian Human Rights legislation. **Student Accommodation Policy:** http://www.dal.ca/campus_life/student_services/academic-support/accessibility.html

Students who require accommodation for classroom participation or the writing of tests and exams should make their request to the **Advising and Access Services Centre (AASC)** prior to or at the outset of the regular academic year. More information and the **Request for Accommodation** form are available at www.dal.ca/access.

ACADEMIC INTEGRITY

Academic integrity, with its embodied values, is seen as a foundation of Dalhousie University. It is the responsibility of all students to be familiar with behaviours and practices associated with academic integrity. Instructors are required to forward any suspected cases of plagiarism or other forms of academic cheating to the Academic Integrity Officer for their Faculty.

Policy on Intellectual Honesty and **Faculty Discipline Process**:
https://www.dal.ca/dept/university_secretariat/academic-integrity.html

STUDENT CODE OF CONDUCT

Dalhousie University has a student code of conduct, and it is expected that students will adhere to the code during their participation in lectures and other activities associated with this course.
http://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

COPYRIGHT

All members of the Dalhousie community are expected to comply with their obligations under Canadian copyright law. Dalhousie copyright policies and guidelines, including our Fair Dealing Guidelines, are available at http://www.dal.ca/dept/copyrightoffice.html.

DALHOUSIE UNIVERSITY

SERVICES AVAILABLE TO STUDENTS

The following campus services are available to all Dalhousie students. Unless noted otherwise, the services are free.

Service	Support Provided	Location	Contact
General Academic Advising	Help with - understanding degree requirements and academic regulations - choosing your major - achieving your educational or career goals - dealing with academic or other difficulties	**Killam Library Ground floor** Rm G28 **Bissett Centre for Academic Success**	In person: Killam Library Rm G28 By appointment: - e-mail: advising@dal.ca - Phone: (902) 494-3077 - Book online through MyDal
Dalhousie Libraries	Help to find books and articles for assignments Help with citing sources in the text of your paper and preparation of bibliography	**Killam Library Ground floor** Librarian offices	In person: Service Point (Ground floor) By appointment: Identify your subject librarian (URL below) and contact by email or phone to arrange a time: http://dal.beta.libguides.com/sb.php?subject_id=34328
Studying for Success (SFS)	Help to develop essential study skills through small group workshops or one-on-one coaching sessions Match to a tutor for help in course-specific content (for a reasonable fee)	**Killam Library 3rd floor** Coordinator Rm 3104 Study Coaches Rm 3103	To make an appointment: - Visit main office (Killam Library main floor, Rm G28) - Call (902) 494-3077 - e-mail Coordinator at: sfs@dal.ca or - Drop in to see us during posted office hours **All information can be found on our website: www.dal.ca/sfs**
Writing Centre	Meet with a tutor to discuss writing assignments (lab report, research paper, thesis, poster) - Learn to integrate source material into your own work appropriately - Learn about disciplinary writing from a peer or staff member in your field	**Killam Library Ground floor** Learning Commons & Rm G25	To make an appointment: - Visit the Writing Centre in the Killam Learning Commons (Rm G40) and book an appointment - Call (902) 494-1963 - e-mail writingcentre@dal.ca - Book online through MyDal We are open six days a week **See our website: writingcentre.dal.ca**