



Biology & Marine Biology Honours Programs Guide for Students and Supervisors | 2023-24

This file and others can be found at <http://www.dal.ca/faculty/science/biology/honours.html>

Biology & Marine Biology Honours Research and Thesis, and Honours Qualifying Exam
BIOL / MARI 4901 & 4902; BIOL 8880

Class Times

Tuesdays and Thursdays 11:35-12:55

Honours Committee (each serves as program advisor for Biology and Marine Biology honours students)

- Margi Cooper | mhcooper@dal.ca | Chair of Honours Committee
- Patrice Cote | patrice.cote@dal.ca
- Jen Frail-Gauthier | jfrail@dal.ca
- Julie LaRoche | julie.laroche@dal.ca
- Mindy McCarville | mindy.mccarville@dal.ca

Course Grading

Class Presentations	7%	
Seminar Reflections	3%	
Cameron Conference Presentation	10%	February 10, 2024
Thesis	80%	Co-ops submit in Dec or Apr, others in Apr

Main Course Requirements: Biology and Marine Biology (this does not include other 1st and 2nd year requirements – for definitive guidelines, links to the Academic Calendar are provided below)

BSc or BA Concentrated Honours in BIOLOGY

Core Biology Requirements (3.3 GPA including BIOL 3050 or 3078 & 3079 or 3371)

- BIOL 2003 – Animal Diversity
- BIOL 2004 – Diversity of Plants and Microorganisms
- BIOL 2020 – Cell Biology
- BIOL 2030 – Genetics & Molecular Biology
- BIOL 2040 – Evolution
- BIOL 2060 – Ecology

Additional Core Biology Requirements

- BIOL 3050 – Developmental Biology
~ or ~
- BIOL 3078 & 3079 (MARI 3074 & 3076) – Animal Physiology 1 and 2
~ or ~
- BIOL/MARI 3371 – Laboratory in Comparative Animal Physiology

Additional Biology Requirements

- Minimum of 54 credit hours in BIOL or BIOL-equivalent courses (including those listed above) at or above the 2000 level, of which at least 18 credit hours must be at or above the 3000 level
- BIOL 4901 and BIOL 4902

BSc or BA Concentrated Honours in MARINE BIOLOGY

Core Class Requirements (3.3 GPA including BIOL/MARI 3101 OR BIOL/MARI 3761)

- BIOL 2003 – Diversity of Life 1
- BIOL 2004 – Diversity of Life 2
- BIOL 2020 – Cell Biology
- BIOL 2030 – Genetics & Molecular Biology
- BIOL 2040 – Evolution
- BIOL 2060 – Ecology

Additional Core Requirements

- BIOL 3101/MARI 3101
~ or ~
- BIOL 3761/MARI 3761

Additional Requirements

- OCEA 2001 and OCEA 2002
- MATH 2080/STAT 2080
- 15 credit hours from any of the following courses
 - BIOL 3042/MARI 3042 Molecular Ecology
 - BIOL 3063/MARI 3063 Resource Ecology
 - MARI 3074 Physiology of Marine Animals Part I
 - MARI 3076 Physiology of Marine Animals Part II
 - BIOL 3080/MARI 3080 The Ecology and Evolution of Fishes
 - MARI 3090 Marine Mammalogy, or BIOL 3626/MARI 3626 Field Studies of Marine Mammals
 - BIOL 3101/MARI 3101 Microbial Ecology
 - BIOL 3221/MARI 3221 Diversity of Algae

- BIOL 3301/MARI 3301 Invertebrate Biology
- MARI 3602 Introduction to Aquaculture
- BIOL 3761/MARI 3761 Marine Ecology
- MARI 4350 Cutting Edge in Marine Science
- MARI 4665 Hacking the Blue Planet
- Any two MARI SEASIDE course
- Any two OCEA course cross-listed as MARI
- 12 credit hours MARI or MARI-equivalent courses
- MARI 4901 and MARI 4902

Additional Requirements for both Biology and Marine Biology

- Minimum grade requirements
 - **Cumulative B+ average (3.3)** in the Core Requirements listed above, for all those classes taken at the time of application. A cumulative B+ average is also required, for all Core classes, at time of graduation. *(Note that the classes included in the calculation of the Core GPA differs between Biology and Marine Biology)*
 - **Cumulative B average (3.0)** in courses in the honours subject at graduation.
 - No grade below a C in any BIOL / MARI class
 - A maximum of 2 of the above required classes can be repeated once.
- A written thesis is produced, through registration in BIOL / MARI 4901 & 4902.
- A qualifying exam is also registered, via BIOL 8880. Students do not register for 8880; this will appear on the transcript automatically at the time of graduation. This exam is Pass/Fail, and is based solely on two criteria:
 - Attendance and participation in the Honours class.
 - Attendance and presentation at the Cameron Conference.

~ Honours course overview ~

Our **philosophy** regarding Honours is that students should have a high degree of independence and autonomy with respect to their research projects, just as if they were in graduate school. To that end, we stress that the key to success in Honours is the relationship that the student develops with his or her supervisor. With the supervisor's guidance, the student is responsible for pursuing all aspects of their research project. Students learn how to formulate hypotheses and predictions and how to prepare a thesis proposal. They also learn how to conduct laboratory or field research, how to collect and analyse data, and how to write a thesis manuscript. These skills are all learned directly from their research experience, which means that the supervisor is responsible for mentoring the student. The student is expected to take command of their experience and seeks out answers, but of course under the wing of a supervising professor. The faculty members running the Honours course are available to advise the student too, or they can suggest additional or alternate avenues that the student might explore to find answers. The reason that the Biology/Marine Biology Honours program is structured this way is because many of our students eventually enrol in graduate programs, and we believe that this kind of **independent but supervised** approach to research is the best way to prepare students for graduate research. Our program therefore differs from other Honours programs elsewhere at Dalhousie, where students often have structured classroom lectures, scheduled assignments, and exams.

Because the student-supervisor relationship is fundamental to the research process, the department feels it is important to outline certain expectations for undergraduate research. If, at any time, either the student or supervisor(s) do not feel the below expectations are being met, they are encouraged to contact the Chair of the Honours Committee, Margi Cooper.

- Students can expect to have regular communication with their supervisors to receive help with defining their project, with problem solving, and to receive regular feedback as the thesis is being written.
- Students can expect to have a clear understanding of what is expected in thesis writing (e.g. expected length and format, acceptable methodology, validity of topic) and to receive a thorough and fair assessment of their work, with explanations of any negative criticism.
- Students are expected to give serious and considered attention to the advice from their supervisor(s) concerning what they regard as essential changes in the research and/or thesis.
- Students are expected to produce a thesis that is essentially their own work and to acknowledge direct assistance or borrowed material from other scholars or researchers.
- Students can expect their efforts to be focused on their research project. While students may choose to participate in other projects within the research lab, they should not be diverted from the timely completion of their thesis and other course obligations

What should the student and supervisor expect from the Honours class (BIOL/MARI 4901 and 4902)? The Honours class has two functions. First, it serves as the administrative arm of the Biology/Marine Biology Honours Program – students submit their written theses through the class, where it is then distributed to 3 faculty evaluators. These evaluators can come from any department, so long as they have a familiarity with the general thesis subject. Once evaluated, the individual thesis scores are returned to the Honours class and are compiled so that a final Honours thesis grade can be calculated. Second, the Honours class provides students with opportunities for engaging in science communication, in the form of attending and reflecting upon departmental seminars, classroom presentations of each student's thesis work, and presentation at the annual Cameron Conference (see **Appendix 5**). In class, students present the aims and results of their thesis research and get direct feedback from their peers and from the class professors. At the Cameron Conference, students present a more refined version of their class presentations and receive additional feedback from faculty, post-docs, adjuncts, staff, graduate students, and fellow undergraduates.

The honours class also runs a small number of guest lectures, where students are provided with information about resources available to them to aid research, as well as information about graduate funding opportunities and NSERC application procedures. A panel discussion will provide an opportunity for students to ask questions about potential career paths open to Biology and Marine Biology Honours graduates.

Ultimately, the grade that a student receives for his or her Honours courses depends on the class presentation grades (7%), the seminar reflections grade (3%), the Cameron Conference grade (10%) and the thesis grade (80%). The first three scores are class-based communications scores. The thesis grade is the fruit of independent thesis research, done not in the honours class, but in the various laboratories across the Dalhousie campus and elsewhere.

TIMELINE – Registration and Program Details

Honours course BIOL/MARI 4901 and 4902 – timeline to application

By the end of the **Third Year** (i.e. before beginning the Honours program) students should have:

- 1) Completed, or be close to completing, the core classes with a **minimum B+ (3.3) cumulative average**.
- 2) Identified a suitable thesis supervisor and research topic (see **Appendices 1 and 2**). Finding a supervisor is the student's responsibility. Departments maintain lists of professors, with descriptions of their research (e.g. [Biology Department Professors](#)), that can be used to start your search. Supervisors do not have to be from Dalhousie. If a prospective supervisor is not from Dalhousie, or has never supervised a Biology/Marine Biology student before, he/she must be deemed suitable by the Honours committee (**Appendix 1**). The student should contact the Honours committee and provide a CV of the prospective supervisor for review. Once a supervisor and project have been secured by the student, he/she will draft a thesis proposal, which must be submitted to the Honours committee by August 8th, 2023, for students starting in Fall 2023, or by December 6th, 2023, for co-op students starting in Winter 2024. See **Appendix 3** for details about thesis proposals.
- 3) Completed an [Honours Application](#). This must be filled in, reviewed, and approved by an Honours advisor (i.e. member of the Honours Committee, not your Honours supervisor). Once an Honours advisor has signed the application, the student can then submit the form to the Registrar for final approval. ***Please submit your honours application by August 8th, 2023 if you plan to graduate in May 2024.***

During the **Fourth Year** students will:

- 1) Conduct research and write a thesis.
 - **NOTE TO SUPERVISORS:** We ask that all supervisors comment on drafts of their own students' theses whenever drafts are written. We also ask that supervisors provide a formal evaluation of the Introduction and Methods sections of their students' theses when they are submitted at the end of the term in which students take BIOL/MARI 4901. When completed theses are submitted at the end of the term in which students take BIOL/MARI 4902, supervisors do not need to formally evaluate their own students work. Rather, supervisors will evaluate the theses of other students. Ultimately, each student's thesis is evaluated by three other faculty readers - as assigned by the Honours Committee. It is therefore essential that all supervisors help in the assessment of other students. **Generally, the Honours Committee assigns a supervisor between two and three theses for evaluation.**
 - **NOTE ON SABBATICAL LEAVES:** If a supervisor agrees to supervise an Honours Student during their sabbatical, this does not relieve the supervisor from thesis evaluations. Supervisors will still be required to read and evaluate their own student's Introduction and Methods sections, as well as the additional theses assigned by the Honours Committee. Failure to meet this expectation may preclude one from supervising our Honours students in the future.
- 2) Attend the class and participate. Attendance is **mandatory** and will be recorded as this determines whether or not students pass the Honours Qualifying Exam (BIOL/MARI 8880)**.
- 3) Attend/watch 3 Biology Department seminars and for each, complete an assignment in which the speaker's communication skills will be critiqued and/or reflected upon.

- 4) Give oral presentations of their on-going thesis research in class. This should be prepared with the assistance of the thesis supervisor. We ask that supervisors help their students prepare their talks and if possible, attend the class the day of their student's presentation.
- 5) Give an **oral presentation** or a **poster presentation** at the Cameron Conference (February each year). We ask that supervisors help their students prepare their abstract and their presentation, and that supervisors attend the conference and help evaluate the presentations of other students. You will also be asked to contribute a food item to the luncheon for the students.

** In addition to a grade in BIOL/MARI 4901 & 4902, a grade in BIOL 8880: Honours Qualifying Exam will appear on the student transcript when all the requirements for the Honours program have been satisfied. The Biology Department grades this "exam" on a pass/fail basis. In order to pass, students must:

- Satisfy the Honours course requirement listed above AND attend all classes. **ATTENDANCE WILL BE RECORDED** and participation noted.
- Participate and present at the Cameron Conference.

More Specific Information About the Honours Program

1. HONOURS RESEARCH AND THESIS

The aim of the Honours thesis program is to give students their first complete research experience, and to coordinate all aspects of a project -- from conceptualization and identification of research questions and hypothesis, to experimental design and data collection, to data analysis, and finally to interpretation, all of which results in a final written thesis.

1a. Submit a Formal Honours Thesis Proposal

Proposals for thesis projects should be approved BEFORE beginning thesis research. If a student wants to begin research before the start of the Honours class in September (or January for Co-op students), he/she should submit a thesis proposal to the Honours committee asap. All proposals will be circulated through the Honours committee for approval. Guidelines for the proposal are included in the **Appendix 3** at the end of this document. Both the student and the thesis supervisor must sign the proposal.

1b. End of term in which BIOL/MARI 4901 is taken

On the last day of the term in which BIOL/MARI 4901 is taken, the Introduction and Methods sections of the thesis are due, for formal evaluation by each student's supervisor. The grade assigned by the supervisor will constitute 20% of the overall grade.

1c. February Reading Week, End the Research, Thesis Writing

By Reading Week (or by November for the Co-op Honours students) students should have completed their data collection and have begun writing. If at that time experiments and data collection are still on-going, students should attempt to end experiments and begin writing. Students must allow ample time for their

supervisors to provide their very important feedback on the final draft of the thesis. See **Appendix 4** for details on thesis format.

1d. Submit a PDF of the Thesis to the appropriate Assignment drop box on Brightspace

- **Co-op students submit on December 7th, 2023**
- **All others submit in on April 10th, 2024**

We have moved to an electronic thesis review system. Evaluation of a thesis is done by 3 evaluators. The evaluators will receive an electronic version of the thesis, along with a document explaining our scoring criteria. If readers wish to receive a paper copy, we can provide these when requested. The evaluation and final grade depends on three main criteria:

- 30% - Scientific rationale, hypotheses, and predictions
- 20% - Scientific method and experimental design
- 50% - Analysis and interpretation, and writing skills

The grades from all components of BIOL/MARI 4901 and 4902 are summed and a final grade is assigned to both courses as follows:

A+ = > 90	B+ = 77-79.9	C+ = 65-69.9	D = 50-54.9
A = 85-89.9	B = 73-76.9	C = 60-64.9	F < 50
A- = 80-84.9	B- = 70-72.9	C- = 55-59.9	

1e. Thesis extensions

Extensions for submitting theses will be considered on the basis of:

- a documented medical issue
- a letter from the supervisor stating the reasons for an extension and approving the request

Thesis extensions are granted only in very extenuating circumstances, such as a health crisis or in cases where a student's experiments fail due to circumstances outside of his/her control and where such a failure prevents the student from completing a thesis. Each of these cases are reviewed by the Honours Committee before an extension is granted. Requests for extensions so that a student can expand a thesis into a manuscript for submission are not granted. Creating a publishable manuscript is indeed encouraged, but the thesis must be submitted at the end of the Honours course in April (or December option for Co-ops)

Requests for extensions must be submitted in writing to the Honours Committee two weeks BEFORE the thesis submission date in April. The student will then have until August 1st to complete and submit the thesis.

Those receiving an extension will not graduate in May, but will do so the following October. The student will receive an "INC" on their record (BIOL/MARI 4901 & 4902). When the final grade has been determined in August, the INC will be removed and the appropriate grade inserted. If students intend to graduate in May, then a thesis extension is not possible.

Theses submitted after the deadline, without a formal extension, will receive a late penalty of 15% per day.

2. CAMERON CONFERENCE

The Cameron Conference is a one-day event held on a **Saturday during the winter term, usually in early February**, and is organized by the Honours Committee in a format similar to any formal, international, scientific conference. Students will give either an oral presentation or a poster presentation that describes their Honours research or last Co-op work term. Teams of faculty will evaluate each presentation, and student attendance and participation at the conference is used to satisfy part of the requirement for the qualifying exam (BIOL/MARI 8880.00). **Attendance is mandatory for all students. Reschedule any other commitments.** Co-op Honours students who start the class in January have not normally started their Honours thesis work yet and can therefore prepare a poster on their last co-op work term. More details on the Cameron Conference are found in **Appendix 5**.

3. Other information

Library resources - <https://libraries.dal.ca/>

A new Biology subject specialist at the Killam Library is being hired. Until there is a person in the position, help can be requested at killmref@dal.ca. There are also several workshops and online tutorials offered by the library to aid research (e.g. literature searches), which can be key to developing ideas and research questions.

Biology Libguide - <http://dal.ca.libguides.com/biology>

Marine Biology Libguide - http://dal.ca.libguides.com/marine_biology

Integration with the Biology Department

Students are encouraged to attend weekly FISH talks, the departmental informal seminar series held each Friday at 3:30pm in the 5th floor lounge. Weekly Departmental seminars occur on Thursdays at 11:30am. Notices for these events are usually posted on the Biology homepage.

Science Atlantic Biology Undergraduate Conference

The Biology Department sends student delegates to the Science Atlantic Aquaculture and Fisheries and Biology Conference, held each year in early March at alternating institutions. A group of students will be selected from the presenters at the Cameron Conference to attend this year's conference and give presentations. More details will be available in February.

Appendix 1: Procedure for having an external, non-Biology faculty scientist approved as a Biology or Marine Biology Honours supervisor

Meet with a member of the Honours Committee to discuss the potential external supervisor. If the external has supervised Biology or Marine Biology Honours students in the recent past, s/he will be automatically approved.

If the external has never (or rarely) supervised Honours students, the Committee will request either:

- Confirmation that the proposed external is a member of the Faculty of Graduate Studies at Dalhousie. If the external is a member of our faculty, s/he will be automatically approved.
- or -
- If the external is NOT a member of the Faculty of Graduate Studies and has not been previously approved to supervise students, the Committee will need a copy of his/her CV, showing the degree earned, present position, and list of recent publications.

At minimum, external supervisors must hold a PhD, have published in the primary scientific literature, and (ideally) have previously supervised Honours or other undergraduate student projects.

Appendix 2: Suitable Honours projects

The research projects that Honours students use for their Honours theses **MUST BE DIFFERENT FROM ANY OTHER RESEARCH PROJECTS FOR WHICH THEY MAY GET CREDIT IN OTHER CLASSES**. This applies to projects that are submitted as part of credit for an Independent Research class at Dalhousie and/or for research-based classes at another University. There must not be any overlap between the Honours thesis research and any other research for which the student has already (or will concurrently) receive credit. If a student or supervisor has questions about this, contact Chair of the Biology Department's Curriculum Committee for a copy of the Guidelines for Independent Research Classes.

The Biology Department considers proposals for several types of Honours theses that are capable of meeting the requirement for generation of new knowledge. They are listed below, more or less in order of increasing difficulty from the student's point of view.

- 1) Adequately designed laboratory or field research in which the student collects his or her own data.
- 2) Analysis of historical data: "Historical" in this sense means, not ancient history, but analysis of published or unpublished data collected by other researchers. The new knowledge consists of the creative analysis and conclusions drawn from the data. (Examples of "historical" data are databases from other studies, records of whaling catches from sea captains logs).
- 3) Theoretical research: Examples might be contributions to theories of the evolutionary significance of apoptosis (programmed cell death), sexual reproduction or optimal foraging strategies. This type of thesis might be associated with analysis of historical data as in (2), above.
- 4) Creative review of present knowledge: A straightforward review of the current state of knowledge in some area of science, similar to the review papers you may already have written in connection with particular

courses, will NOT meet the Honours requirement for generation of new knowledge. However there are circumstances in which a creative review can lead to new understanding, particularly where the field is deadlocked in controversy. Examples might be the technical analysis of estimates of heritable variation in IQ, ethical issues connected with proprietary use of DNA sequences, permissible exposure limits for toxic or radioactive substances in the environment etc. A student who chooses this type of thesis will have to convince his or her Honours supervisor, in advance, that the thesis has a good chance of contributing new understanding of the issue. The Honours supervisor and the student together will then have to convince the Honours Committee.

Appendix 3: Guidelines for the Honours Thesis Proposal

The proposal should be approximately 1-page long, but it can be up to 2 pages. It must provide sufficient details about the specific scientific question(s) being addressed. The proposal must be clearly written, using concise, jargon-free language, and should contain:

- 1) An overview of the relevant background literature, which provides a broader context for the specific study. This helps us to understand why the study is important and whether it is feasible. Only the most important references, with no more than 5 key references, should be cited.
- 1) Statement of the scientific question that will be addressed. This should be a specific question that can be answered within the time constraints of the Honours thesis. This should take the form of a specific hypothesis or hypotheses, with testable predictions.
- 2) A concise description of the methods that will be used to address the questions, hypotheses, and predictions. What is the general experimental design? What will be measured? What experimental, analytical, and statistical methods will be used? These should be fairly general, but must provide enough information to allow the Honours committee to determine whether the methods are appropriate for the study.
- 3) Where relevant, disclosure of any issues relating to intellectual property rights associated with the project.

STUDENTS MUST SUBMIT THEIR HONOURS PROPOSAL USING THE TEMPLATE COVER SHEET FOUND HERE:

<https://www.dal.ca/faculty/science/biology/honours/thesis-proposal-template.html>

In the proposal, clearly state the student's name and the supervisor's name. Both student and supervisor must **sign** the proposal.

Structure the **proposal** with these headings:

- 1) COVER SHEET – with Title, Names of Student and Supervisor(s), and Signatures of both.
- 2) Overview / Background
- 3) Specific scientific question, hypotheses, and predictions
- 4) Methods and experimental design

Appendix 4: Thesis formatting

The following guidelines for the preparation of the thesis are adapted from the regulations for preparing postgraduate theses at Dalhousie. The thesis should roughly follow the standard format of a scientific report, and contain the elements listed below. Supervisors can provide specific details about thesis structure. THESE

MUST BE WRITTEN IN THE FIRST PERSON SINGULAR, AND WHEN CERTAIN ASPECTS OF THE STUDY WERE CONDUCTED BY OTHER PEOPLE (e.g. LAB MATES) IT SHOULD BE MADE CLEAR WHO DID WHAT.

Parts of the thesis and their order of appearance

1. Title page (see sample at the end of this appendix) – THESIS MUST BE FIRST PERSON SINGULAR – ONLY 1 AUTHOR!
2. Dedication page (optional)
3. Table of Contents
4. List of Tables and/or Figures (optional; used when Tables and Figures are dispersed throughout body of thesis)
5. Abstract (1 page)
6. List of abbreviations and symbols used (optional)
7. Acknowledgments (optional)
8. Body of thesis (main text)
 - Introduction
 - Methods and materials
 - Results
 - Discussion
 - References / Literature cited (see below for details about formatting)
9. Tables (if not using a List of Tables and/or Figures as above)
10. Figures (if not using a List of Tables and/or Figures as above)
11. Appendices (optional)

Page Formatting

- Standard 8.5" X 11" inch paper
- Double-spaced
- Margins: 1.0 inch (2.5 cm) on all sides.
- Pages can be double-sided.
- Font: 12 pt.
- Table and Figure captions should accompany tables and figures in a consistent fashion, either on the same pages as the table or figure or on the preceding page.
- All pages will be numbered consecutively, excluding Title Page (the Title Page is not numbered but is considered to be the first page). Numbering begins on the next page, which will be page 2. Conventionally, preliminary pages (i.e. everything prior to the body of the thesis) are numbered with lower-case Roman numerals (i,ii,iii,iv etc.) in the bottom right corner of the document. Arabic numbering (1,2,3,4, etc) then begins with the body of the thesis and runs through to the end of the document.

References

These can be formatted in any Surname-Year style, just be sure to be consistent. You can use CSE guides for references or use the style of any peer-reviewed journal.

The formatting of the title page should conform to the example provided on the next page:

Thesis Title

by

Student Name

Submitted in partial fulfilment of the requirements for the
degree of Honours Bachelor of Science in Biology
(or Marine Biology)

at

Dalhousie University
Halifax, Nova Scotia
Month and Year of Submission

© Student Name, Year

Appendix 5: CAMERON CONFERENCE

Sponsored by: Department of Biology, Dalhousie University
 Dalhousie Association of Biology Students
 Dalhousie Association of Marine Students

The Cameron Conference is held annually to showcase the diversity of research conducted by the Biology and Marine Biology Honours students. The conference format is similar to that of an international scientific conference and includes both oral presentation and poster presentation sessions.

All Honours students must present either an oral presentation (limited to 8 students chosen by the class evaluators), or a poster presentation (all the rest). These presentations will highlight student research, or in the case of Co-op students, work done during their last work term.

Written Abstracts must be submitted to the appropriate Assignment drop box on Brightspace in January each year. These will be published in the Conference Programme / Book of Abstracts, which will be given out at the Cameron Conference to all in attendance.

Abstract Format

Students will submit their abstract using the Abstract Template file, which can be downloaded from the Honours Brightspace site.