

**Faculty of Science and Faculty of Graduate Studies Course Syllabus
Department of Biology**

MARI 3761.03 — BIOL 3761.03
Marine Ecology
Fall 2019

Instructor: Dr. Diego Ibarra | *e-mail:* Diego.Ibarra@dal.ca | *Office:* LSC-3625 (Oceanography)

Office hours: by appointment

Lectures: Tue, Thu, Fri 8:35 - 9:25 | *Location:* Studley LSC-COMMON AREA C244

Tutorial: Fri 9:35 - 10:25 | *Location:* Studley LSC-COMMON AREA C244

TA: Jessica Bennett | email: js344308@dal.ca

Course Description

Building upon an understanding of basic ecological and evolutionary principles, and a familiarity with the major marine invertebrate and algal taxa, this course examines patterns and processes at the organismal, population and community levels that determine the diversity and distribution of life in the sea.

Course Prerequisites, Cross-listings and Restrictions

- **Prerequisites:** BIOL 2060.03 (or BIOA 3001.03), and (BIOL 2003.03 or BIOL 2004.03) and OCEA 2000X/Y.06 or (OCEA 2001.03 and OCEA 2002.03)
- **Cross-listings:** BIOL 3761.03
- **Restrictions:** This course is restricted to 3rd and 4th year students

Course Objectives/Learning Outcomes

- Contrast the physical and chemical environment in the ocean with that on land, and explain how the ocean milieu has shaped the evolution of life and the structure and functioning of marine ecosystems
- Explain the interplay of biological interactions and physical factors in determining patterns of intertidal zonation on rocky shores
- Contrast developmental strategies of marine invertebrates with larval forms, in terms of evolutionary trade-offs and biogeographic patterns
- Account for variation in patterns of larval dispersal, settlement and recruitment among benthic invertebrates, in terms of oceanographic features and biological factors
- Explain processes that determine patterns of distribution, abundance and productivity of kelp beds/forests along temperate coasts
- Explain the roles of disturbance and biological interactions (competition, grazing, predation and disease) in shaping community organization in kelp beds/forests worldwide, and the impact of invasive species on the kelp-bed ecosystem of the Northwest Atlantic
- Describe the distribution, environmental features, and trophic structure of tropical coral reefs

- Account for the high productivity and diversity of coral reefs, and their vulnerability to environmental stressors and human impacts
- Describe the physical, chemical and biological environment of the deep-sea, and explain how this accounts for patterns of species abundance and diversity
- Account for the high productivity and biomass, but low species diversity, at hydrothermal vents
- Evaluate the effects of humans, past and present, on marine species, populations and ecosystems worldwide
- Participate in the development and execution of outreach and fundraising activities in support of the critically endangered Canadian salmonid Atlantic Whitefish (*Coregonus huntsmani*)

Course Materials

Textbook (optional):

- Nybakken JW and Bertness MD (2004) Marine Biology: An Ecological Approach. 6th Edition. Benjamin Cummings, San Francisco

Class notes:

Class notes are posted on Brightspace. Announcements and additional material will be posted often, and students should check the site frequently.

Course Assessment

Component	Weight (% of final grade)	Date
Daily Quizzes	50	Every lecture
Midterm exam	16	Tue, Oct 15
Mini Final exam	19	Fri, Nov 29
Participation in project "Saving the Atlantic Whitefish" †	15	Fridays (Lecture + Tutorial)
TOTAL	/100	

† Teamwork component

Daily Quizzes

At the beginning of most lectures, a written quiz (approx. 10 minutes) will be applied to test the material taught during the previous lecture (plus one question from previous quizzes). Students are **required** to bring and use a **hand-written "cheat-sheet"** for each Daily Quiz. Cheat-sheets not meeting specifications (see below) will result in a zero grade in the corresponding quiz. Note that appropriate documentation is required to justify missed quizzes (see in: Course Policies > Missing a class).

Cheat-sheet specifications:

- Cheat-sheets are personal. **Copying somebody else's cheat-sheet is a serious plagiarism offence** requiring the instructor to report all involved parties to the Academic Integrity Office.
- Cheat-sheets **MUST** be hand-written on paper. Digitization, electronic manipulation, photocopying, photographing and/or printing of cheat-sheets is not allowed.
- Size: each cheat-sheet is limited to one side of a letter-sized sheet of paper.
- Content: Anything you want, but **must** demonstrate effort to synthesize lecture content.

Midterm exam

Unlike Daily Quizzes, it is **NOT** allowed to bring a cheat-sheet to the midterm exam.

Mini Final exam

Unlike Daily Quizzes, it is **NOT** allowed to bring a cheat-sheet to the mini final exam.

Participation in project “Saving the Atlantic Whitefish”

The Atlantic Whitefish (*Coregonus huntsmani*) is a critically endangered salmonid that is only found in a few lakes in Nova Scotia. Every Friday, the class will devote 2 hours (lecture + tutorial time) to planning, development and execution of activities to (1) increase awareness in the general public and (2) do fundraising. The class (guided by the instructor) will brainstorm and come up with many potential activities. Examples of activities could be social media campaigns, organization of events, website development, etc. Then, the feasibility and impact of each activity will be assessed by the class/instructor in order to determine which activities will be executed during the term. Teams of students will execute the activities. Some of the activities may last several weeks and may require weakly tweaking. Evaluation of participation will be evaluated on a per-activity basis, according to the table below.

Description	%
Did not attend activity	0
Attended, but did not participate in, or contribute to the activity	50
Attended, but minimally participated in and/or contributed to the activity	75
Attended and participated in and/or contributed to the activity	100

Conversion of numerical grades to Final Letter Grades

Undergraduate students follows the [Dalhousie Common Grade Scale](#). Graduate students follows a more strict scale, where a minimum of 70% (B-) is required to pass.

%	Letter Grade	Grade Point Value	Definition
90 - 100	A+	4.30	Exceptional
85-89	A	4.00	Excellent
80-84	A-	3.70	Very Good
77-79	B+	3.30	Good
73-76	B	3.00	
70-72	B-	2.70	
65-69	C+	2.30	Satisfactory
60-64	C	2.00	
55-59	C-	1.70	
50-54	D	1.00	Marginal Pass
<50	F	0.00	Failure

Course Policies

Attendance is mandatory: Students are required to attend to all classes, and to remain in class for its entire duration.

Missing a class:

- Email **both**, the TA and the Instructor, briefly explaining your circumstance and dates.
- You also need to fill in a [Student Declaration of Absence \(SDA\) form](#) and upload it to the Brightspace Dropbox designated for SDAs.
- Students with an Accessibility or Accommodation Plan in place **do not** need to submit SDA form.

Brightspace will be used to post lectures, updates and announcements.

Late assignments: A 10% reduction in grade will be applied for every day an assignment is late.

Assignment submission: Assignments should be submitted via Brightspace as .pdf file by 11:59 pm on the due date.

Course Content

Week	Day	Date	Content
Module 1. Life on land and in the sea: Worlds of contrast			
1	1	Tue, Sep 3	1.1 Class Introduction
	2	Thu, Sep 5	1.2 Physical/chemical environment, suspension, swimming, filter feeding
	3	Fri, Sep 6	Class + Tutorial: Saving the Atlantic Whitefish
2	4	Tue, Sep 10	1.3 Light, sound, & pressure; ecosystem structure & function
Module 2. The rocky intertidal zone: A test bed for ecological theory			
	5	Thu, Sep 12	2.1 Environment, zonation
	6	Fri, Sep 13	Class + Tutorial: Saving the Atlantic Whitefish
3	7	Tue, Sep 17	2.2 Competition & predation
	8	Thu, Sep 19	2.3 Biological & physical factors; seaweeds & grazing
	9	Fri, Sep 20	Class + Tutorial: Saving the Atlantic Whitefish
4	10	Tue, Sep 24	2.4 Patchiness, succession, disturbance, latitudinal gradients
Module 3. Reproduction, larval ecology, & recruitment			
	11	Thu, Sep 26	3.1 Asexual & sexual reproduction, fertilization rate
	12	Fri, Sep 27	Class + Tutorial: Saving the Atlantic Whitefish
5	13	Tue, Oct 1	3.2 Larval developmental strategies, mortality
	14	Thu, Oct 3	3.3 Dispersal, larval behaviour, settlement, recruitment
	15	Fri, Oct 4	Class + Tutorial: Saving the Atlantic Whitefish
Module 4. The rocky subtidal zone: A hot bed of biological interactions			
6	16	Tue, Oct 8	4.1 Habitats, biological & physical factors, hydrodynamics
	17	Thu, Oct 10	4.2 Kelp beds/forests: distributional patterns, productivity
	18	Fri, Oct 11	Class + Tutorial: Saving the Atlantic Whitefish
7	19	Tue, Oct 15	MIDTERM
	20	Thu, Oct 17	4.3 Urchin-kelp interactions, trophic cascades
	21	Fri, Oct 18	Class + Tutorial: Saving the Atlantic Whitefish
Module 5. Tropical coral reefs: Oases in a desert ocean			
8	22	Tue, Oct 22	5.1 Reef distribution, origin & structure, biological assemblages
	23	Thu, Oct 24	5.2 Coral productivity, species interactions, disturbance



	24	Fri, Oct 25	Class + Tutorial: Saving the Atlantic Whitefish
9	25	Tue, Oct 29	5.3 Human impacts, climate change and the fate of reefs
Module 6. The deep: Mountains, plains & hot springs			
	26	Thu, Oct 31	6.1 Environment, patterns of abundance & diversity
	27	Fri, Nov 1	Class + Tutorial: Saving the Atlantic Whitefish
10	28	Tue, Nov 5	6.2 Adaptations, symbioses, biological processes
	29	Thu, Nov 7	6.3 Hydrothermal vents
	30	Fri, Nov 8	Class + Tutorial: Saving the Atlantic Whitefish
11		Tue, Nov 12	Fall Study Break
		Thu, Nov 14	Fall Study Break
		Fri, Nov 15	Fall Study Break
Module 7. The frozen seas: The Artic and Antarctic			
12	31	Tue, Nov 19	7.1 Environment, patterns of abundance & diversity
	32	Thu, Nov 21	7.2 Polynyas
	33	Fri, Nov 22	Class + Tutorial: Saving the Atlantic Whitefish
13	34	Tue, Nov 26	7.3 Human impacts and climate change
Course review			
	35	Thu, Nov 28	Exam preparation, course evaluation and review
	36	Fri, Nov 29	Mini final exam

NOTE: Lecture dates and topics may change depending on course pace and weather-related class cancellations.

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: <http://www.dal.ca/cultureofrespect.html>

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

https://www.dal.ca/academics/important_dates.html

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Missed or Late Academic Requirements due to Student Absence (policy)

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

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

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: <https://dsu.ca/dsas>

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>