DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Biology
MARI/BIOL 3626
Field Studies of Marine Mammals
July/August 2022

Instructor: Prof. Elizabeth Zwamborn (she/her)

Email: The best way to contact Prof. Z. is by email: elizabeth.zwamborn@gmail.com. Emails will be responded to within 24 hours.

Demonstrators: Natalie Colbourne (she/her), Chad Steverding (he/him)

Field Demonstrator: Marie-Ève Clark (they/them)

On campus at Dalhousie: July 25th-30th (9:00-17:00), August 8th-9th (9:00-17:00)

Field trip to Cape Breton: August 2nd-6th

Course Description

This course is an intensive hands-on introduction to marine mammal research, with emphasis on the field. Lectures incorporate information research techniques, logistics, etc. involved in running a successful field season, in addition to an overview of taxonomy, communication, life history, ecology, behaviour, culture, and conservation, particularly as they relate to the marine mammals of Atlantic Canada. Labs include a necropsy, acoustic analysis, species identification, field season planning, and techniques of photographic identification of marine mammals. During our 5-day camping trip, you will observe marine mammals from a whale-watching vessel off of Bay St. Lawrence, Cape Breton and conduct research projects.

Course Prerequisites

BIOL 2060.03, BIOL 3062.03 (or BIOL 3630.03 or PSYO 2160.03), STATS 1060.03 (or equivalent)
CROSS-LISTING: BIOL 3626.03
AND
Flexibility, the willingness to acknowledge that each trip at sea might yield many whales or none (nature is nature, but usually we are very successful), and the ability contend with **early** hours & long days!

Course Learning Outcomes

1. To develop an appreciation for the diversity, distribution, natural history and ecology of all marine mammals, and to be able to recognize and identify - both with common and scientific name, the marine mammal families of the taxa Cetacea, Carnivora (including Pinnipedia), and Sirenia.

2. To be able to recognize and identify - common and scientific names - the species of marine mammals commonly found Atlantic Canadian waters and develop an understanding of their history and use in the Maritimes, from their importance to the Indigenous Peoples pre-colonization all the way forward until the present day (including the commercial whaling history of this area).

3. To have some understanding of the biological and evolutionary history of the marine mammals and develop a comfortable, working knowledge of the taxonomy of the marine mammals.

4. To learn what goes into planning a marine mammal research field season and how to prepare for one.

5. To expose you to marine mammal researchers and the types of research being undertaken with regards to marine mammals, with emphasis on local studies.

6. To help you understand the current controversies surrounding marine mammals and the conservation efforts that have been made on their behalf; the legal guidelines for protecting, managing/regulating and observing these animals and the current challenges to those laws and regulations.

Course Materials

There is no textbook for the course, but there are many books at the Killam Library. You can book a time slot at the library or arrange for curbside pickup https://libraries.dal.ca/hours-locations/killam.html. PDFs or PPTs will be available for lectures on Brightspace.

Key books in the Dalhousie Library:

Gaskin, DE. The ecology of whales and dolphins. QL 737 C4 G24 1982

Reeves, RR et al. The Sierra Club Handbook of seals and sirenians. QL 737 P6 R44 1992

King, JE. Seals of the World. QL 737 P6 K5 1983

Ridgeway, SH and Harrison, R. Hand book of marine mammals (volumes 1 – 6). QL 713.2 H354 v. 1-6.

Riedman, M. The pinnipeds: Seals, sea lions and walruses. QL 737 P6 R54 1990

Evans, PGH. The natural history of whales and dolphins. QL 737 C4 E93 1987

Berta, Annalisa. Marine Mammals: evolutionary biology QL 713.2 B47 1999

Evans, Peter G.H. and Raga, J.A. (eds) Marine Mammals Biology and Conservation. QL 713.2 M354 2001

Boyd, I. (ed) Marine mammals: advances in behavioural and population biology QL 1Z8 1992

Perrin, W.F., Wursig, B., Thewissen, J.G.M. (eds) Encyclopedia of Marine Mammals. QL 701.2 E3 2002

Hoelzel, R. (ed). Marine Mammal Biology: an evolutionary approach, QL 713.2 M37 2002

Key Journals to use as references:

Marine Mammal Science, Canadian Journal of Zoology, Canadian Field Naturalist (especially COSEWIC status reports), Reports of the International Whaling Commission, Aquatic Mammals, Marine Ecology Progress Series, Ecology, Oikos, Oecologia, Proceedings of the Royal Society of London, Polar Biology, Journal of Zoology, Journal of Animal Ecology, Behavioral Ecology, Behavioural Ecology and Sociobiology
You need your Dalhousie credentials to access copyright-protected journals. Find out how to use Library resources from off-campus.)

Article Searches via Dalhousie Online Databases:

Google Scholar
ASFA (Aquatic Sciences and Fisheries Abstract)
Web of Science
Biological Abstracts

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Course Assessment

Component	Value (%)	Date due (all times Atlantic)
Workshops/labs (4 x 4%)	16	Various
Project proposal and Data Sheet (group)	10	Sunday July 31st, 17:00
Exam	20	Saturday July 30th, 09:00
Participation	5	Throughout course, especially field trip
Field Notebook	10	Saturday Aug 6th, 17:00
Journal Club Questions	4	Monday Aug 8th, 09:00
Oral Presentation (group)	10	Tuesday Aug 9th, 09:00 – 11:00
Final Report	25	Tuesday Aug 9th, 19:00

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)	

Course Policies

(1) The course is intensive and demanding and you should **prepare to devote yourself entirely to the course for its duration.** It is recommended that you do not balance employment simultaneously.

(2) It is important to keep up with work. Unexcused late assignments will be deducted at a rate of 25% per day. Valid excuses include those for sickness or emergencies. Medical reasons for lateness require a doctor's note upon return to class.

(3) You are expected to attend and participate in all course activities.

(4) You MUST adhere to all safety guidelines including those that will be discussed in the first week of classes. While on the field trip, if you plan to leave the group, you must use the buddy system--stay in groups of 2 or more--AND inform the instructors of where you are going and when you will return. For everyone's safety, **consumption of alcoholic beverages or other mind/behaviour altering substances is NOT permitted** on the field trip.

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***Schedule subject to modification without notice**

Monday July 25th	09:00 - 09:45	Intro to Course
	09:45 - 10:15	Intro to Marine Mammals
	10:15 - 12:00	Cetacean Taxonomy
	12:00 - 13:00	***Lunch Break***
	13:00 - 14:30	**Photo-ID Workshop**
	14:30 - 15:30	Cetacean Evolution
	15:30 - 16:00	Social Complexity Hypothesis (Chad Steverding)
	16:00 - 17:00	Research Groups & Pick Topics
Tuesday July 26th	09:00 - 10:45	Cetacean Ecology and Life History
	10:45 - 12:00	Spotlight: Pilot Whales
	12:00 - 13:00	***Lunch Break***
	13:00 - 14:30	**Acoustics Workshop** (Felicia Vachon)
	14:30 - 15:00	Intro to Pinnipeds and Taxonomy
	15:00 - 15:45	Pinniped Evolution, Life History, Anatomy and Physiology
	15:45 - 16:15	Other Marine Mammals of the Maritimes
	16:15 - 17:00	Group Work on Project
Wednesday July 27th	09:00 - 11:00	Settlers and Marine Mammals of Atlantic Canada
	11:00 - 12:00	Marine Mammals and Indigenous Peoples
	12:00 - 13:00	***Lunch Break***
	13:00 - 14:00	Marine Mammal Pathology
	14:00 - 15:00	**Species Identification Workshop**
	15:00 - 16:00	Spotlight: Northern Bottlenose Whales (Laura Feyrer)
	16:00 - 17:00	Group Work on Project
Thursday July 28th	09:00 - 12:00	Field Research Techniques Part I
	12:00 - 13:00	***Lunch Break***
	13:00 - 14:00	Spotlight: North Atlantic Right Whales (TBA)
	14:00 - 15:00	Organizing a Field Season
	15:00 - 16:00	**Field Season Planning Workshop**
	16:00 - 17:00	Group Proposal Presentations + Project Work!
Friday July 29th	09:00 - 12:00	**Necropsy Lab** (D.V.M. Laura Bourque)
	12:00 - 13:00	***Lunch Break***
	13:00 - 14:30	The Importance of Marine Mammal Conservation
	14:30 - 15:00	Marine Mammal Rescue (Chad Steverding)
	15:00 - 16:00	Spotlight: Killer Whales
	16:00 - 17:00	Group Work on Project
Saturday July 30th	09:00 - 11:00	**Final Exam**
	11:00 - 12:00	Marine Mammals and Sea Birds of Cape Breton Island
	12:00 - 13:00	***Lunch Break***
	13:00 - 14:30	**Species Identification Workshop**
	14:30 - 16:00	Whale Fall
	16:00 - 17:00	Group Work on Project
Sunday July 31st	Study Day **5:00 PM Finalized Group Proposal and Datasheets Due**	
Monday August 1st	**HOLIDAY – Prepare for the Field!**	

Tuesday August 2nd (**FIELD TRIP)**	08:30	Meet at Parking Lot, Drive to Cape Breton Spotlight: Beluga Whale Monitoring (Marie-Ève Clark)
Wednesday August 3rd (**FIELD TRIP)**		All day boat charter Work on data in evenings
Thursday August 4th (**FIELD TRIP)**		All day boat charter Work on data in evenings
Friday August 5th (**FIELD TRIP)**		All day boat charter Work on data in evenings
Saturday August 6th (**FIELD TRIP)**	08:00 **17:00**	Departure; Return to Halifax **Field Notebook Due**
Sunday August 7th	Day off to prepare journal readings, reports, and presentations	
Monday August 8th	**09:00** 09:00 - 10:00 10:00 - 12:00 13:00 - 17:00	**Journal Questions Due** Journal Club Current Controversial Issues: Captivity, Sealing/Whaling, Etc. Afternoon for Work: Project Guidance Available
Tuesday August 9th	09:00 - 11:00 11:00 - 12:00 12:00 - onwards **19:00**	**Oral Presentations** Pursuing a Career in Marine Mammal Sciences Afternoon for Work: Project Guidance Available **Final Papers Due**

Field Projects

The main focus of the course is to conduct your own research project on marine mammals off Cape Breton, including such key steps as formulating your hypothesis, collecting data, analysing data, writing a scientific paper, and providing a scientific presentation. There are several potential projects outlined below. Groups will consist of 4 people, and each group project must be substantially different from other groups. Data should be collected jointly within the group and work should be shared EQUALLY amongst all group members.

Project ideas

From one of the project ideas below, expand on the research question and formulate a hypothesis.

1) Marine mammal acoustics: Odontocetes use sounds to communicate and navigate and have a wide range of acoustic signals. Pilot whales have a rich vocal repertoire. Do pilot whales produce sounds in all behavioural states? How might these sounds vary with different behavioural states?
2) Marine mammal site fidelity: Several marine mammal species appear off Cape Breton, some of which may exhibit short- (within a season) or long- (across years) term fidelity to the area. Use photo-identification techniques to determine site fidelity. Do the same animals remain in the area or are different individuals observed each day? Do groups remain stable across days? Were these animals seen in the area in previous years (photo-id catalogues available!)?
3) Marine mammal diving behaviour: Cetaceans exhibit different dive types which are related to their activity underwater. What are the surfacing intervals and dive patterns? Do they differ between individuals? Do they differ with group factors (e.g., behavioural state, size, or composition)? What are the factors that drive similarities or differences in the features of dives among individuals of the same species?
4) Marine mammal behavioural synchrony: The ocean is a dangerous environment and young marine mammals are reliant on adults for survival. To what degree do calves synchronize their

behaviours with adults? Does the degree of synchrony change with calf age or behavioural state? Do calves switch between adults?

5) Inter-specific interactions: Odontocetes are typically social animals and are often observed interacting with other species, in particular, with sea birds. Do these interactions occur more when cetaceans are in particular behavioural states? Do they vary with group size and composition? Are these interactions asymmetric, where one species gains or loses and the other species is unaffected? Are most markings and scars on whales acquired from inter- or intra-specific interactions?
6) Student project ideas: Be brave and creative and come up with your own idea. Feel free to discuss your thoughts with Prof. Zwamborn and the other demonstrators.

You will be required to hand in your project proposal and datasheets by **5:00 PM on Sunday July 31st**. You will be given feedback the next day so that you can make any necessary changes before collecting data in the field. After the field trip, you will be required to analyze the data, give a brief (20 minute) group oral presentation on your project for the class, and write up your project as a scientific paper. Coming up with a project idea/hypothesis, data collection and analysis, and oral presentation will be done in groups, **however your final report** must be done individually and each person will be marked individually.
The final report is due by 7 PM on Tuesday August 9th.

Equipment available

- Boat, with ship-board depth sounder and GPS
- A hydrophone
- Limited number of GPS units, range finders, and timers
- Binoculars
- Bird guide books

* If you have a digital SLR with a telephoto lens of > 200mm you are encouraged to pursue the photo-id project.

Field Conditions

Fieldwork will be conducted off a chartered whale watching boat in Bay of St. Lawrence, Cape Breton (Oshan's Whale Watch; http://oshan.ca). Pilot whales are most frequently observed in the area and trips will be tailored to sight this species for data collection purposes. However, we will watch for all marine mammals, including harbour and grey seals, fin whales, minke whales and harbour porpoises. As these are free-ranging animals, there is no guarantees marine mammals will be seen with every outing. You are expected to identify and log each marine mammal and seabird sighting. There will be a lecture on marine mammal and marine bird identification prior to the field trip.

During the field trip, we will be camping in the northern part of Cape Breton at a local campground (Hideaway campground and oyster market; http://campingcapebreton.com/). You will be sharing tents and cooking facilities. We will be in "field conditions", although there are showers at the campground (coin operated, so bring change). We will be getting up early every morning and it is imperative that everyone is able to sleep by a decent hour. Noise must be kept at a minimum as we are a large group and there are other campers.

Cooking: All meals will be provided. Lots of snacks will also be available, but if you have a snack you can't be without, bring it. Please let us know about ANY DIETARY REQUIREMENTS (vegetarian, vegan, gluten intolerance, allergies, etc.) immediately so that we can plan accordingly. We will rotate through project groups to help with all meal preparations and cleanup throughout the trip. Meals are planned in advance

with the ingredients purchased before departure, so each group will prepare the meal with the help of instructions. **NOTE: Alcoholic beverages or other mind/behaviour altering substances will not be tolerated during the field trip.**

Required Field Gear

PLEASE DO NOT OVER PACK. However, you should ensure that you have sufficiently warm clothing and bedding. The weather in Cape Breton can change rapidly and can be very cool and damp, even in the middle of summer. Fog is common in the evenings, so please bring warm clothing and good rain gear. Even when it's not raining, the boat can get wet. Please bring the following items:

- Daypack to take on the boat
- Reusable water bottle and sandwich container to take on boat
- Sleeping bag, pillow, towel, sleeping pad
- Appropriate clothing for the field: - warm clothes (e.g., fleece, wool, gore-tex, toques, gloves), good rain gear, appropriate footwear (not flip-flops- e.g., well-soled sandals/hiking boots/running shoes/rubber boots)
- Sunscreen, hat, sunglasses (polarized recommended)
- Bug repellent
- Pencils, pens
- Toiletries
- Medications **(* Please inform Prof. Zwamborn about any medical conditions that could disrupt your fieldwork ASAP)**

Recommended Field Gear

- Camera
- Flashlight or headlamp
- Travel alarm or watch alarm
- Hand sanitizer
- Extra set of contacts or glasses
- Power bank or spare batteries for electronic devices (limited places to recharge)

Provided Field Gear

Food, stoves, cooking pots/pans and dishes will be provided. Field books and clipboards will also be provided. You are recommended to bring laptops for data entry and data analysis, but there is no liability for any items lost or stolen. There is free Wi-Fi available at the main house of the campground.

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

Missed or Late Academic Requirements due to Student Absence

As per Senate decision instructors may not require medical notes of students who must miss an academic requirement**, including the final exam**, for courses offered during fall or winter 2020-21 (until April 30, 2021). Information on regular policy, including the use of the Student Declaration of Absence can be found here: **https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html.**

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

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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