

**Faculty of Science Course Syllabus
Department of Biology
MARI/BIOL 3626
Field Studies of Marine Mammals
August 2021**

Instructor: Dr. Dara Orbach (dorbach@dal.ca)

Demonstrator: Lindsay Wood; Elizabeth Zwamborn

Online learning: July 26-29, Aug 1, Aug 8-11, 9:00 - 17:00

On campus at Dalhousie: July 30, 9:00 - 17:00

Field trip to Cape Breton: August 2-6

Course Description

A hands-on introduction to research on marine mammals. Lectures incorporate varied field techniques and provide an overview of marine mammal taxonomy, adaptations, communication, research techniques, life history, ecology, population biology, sociobiology, behaviour, culture, and conservation. Labs include a necropsy, acoustic analysis, behaviour analysis, and techniques of photographic identification of marine mammals. On a 5-day camping trip, students will observe marine mammals from whale-watch boats in 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

Course Learning Outcomes

By the end of the course students will be able to:

- Describe the taxonomic diversity and general biology of marine mammal taxa.
- Describe various anatomical, physiological, and behavioural adaptations of marine mammals to aquatic living.
- Describe examples of marine mammal social structures and techniques used to study them.
- Describe how sound travels in the water, how marine mammals communicate, and the impacts harmful sound can have on populations.
- Describe how marine mammals can serve as bioindicators of environmental variation.
- Name and identify local marine mammal and seabird species, including in the field and through photo identification.
- Describe techniques to estimate marine mammal population abundance.
- Describe what ecological and social factors may drive diverse life history characteristics.
- Describe examples of marine mammal distribution and habitat use.
- Describe aspects of the ecology, sociobiology, and behaviour of different groups of marine mammals and explain how they are studied.
- Describe different reproductive tactics used by marine mammals.
- Describe examples of culture in marine mammals.



- Discuss issues relating to marine mammal conservation and identify conservation and management techniques.
- Apply marine mammal research techniques including acoustic, behavioural, and photo-identification analyses.
- Conduct literature searches of primary and secondary sources using electronic data bases and online search tools.
- Communicate primary literature effectively with peers.
- Understand the local ecology of Cape Breton.
- Develop skills in note taking in the field and identification of species.
- Participate constructively in a field camp setting (e.g., cooking, cleaning, shared living in tents).
- Develop and carry out a field study, from initial proposal through to final data analysis and interpretation.
- Produce a scientific report based on the field study.
- Deliver an oral presentation relating the field study findings.
- Identify elements of marine mammal anatomy during a necropsy.

Course Materials

There is no textbook for the course, but there are many books at the Killam Library. 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

Article Searches via Dalhousie Online Databases:

Google Scholar

ASFA (Aquatic Sciences and Fisheries Abstract)

Web of Science

Biological Abstracts

Course Assessment

Component	Value (%)	Date due
Workshops/labs (4 x 4%)	16	Various
Project proposal and data sheet (group)	10	Saturday July 31, 5 PM
Exam	20	Sunday Aug 1, 9 AM
Participation	5	Throughout course, especially field trip
Field book	10	Friday Aug 6, 5 PM
Journal club questions	4	Sunday Aug 8, 9 AM
Oral presentation (group)	10	Wednesday Aug 11, 9:00 – 1:00 PM
Final report	25	Wednesday Aug 11, 7:00 PM

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 students should prepare to devote themselves entirely to the course for its duration.
- (2) It is important to keep up with work. Unexcused late assignments will be deducted at a rate of 15% 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.

Schedule subject to modification without notice

Monday July 26th	9:00 - 10:15 AM 10:30 - 12:00 PM 1:00 - 2:30 PM 2:45 - 4:00 PM 4:00 - 5:00 PM	Intro to course Intro to marine mammals Adaptations Marine mammals and sea birds of Cape Breton Form groups and pick topic
Tuesday July 27th	9:00 - 10:30 AM 10:30 - 11:45 AM 12:45 - 1:45 PM 1:45 - 3:30 PM 3:30 - 5:00 PM	Life history; Ecology Research Techniques Conservation Photo-id workshop Group work on project
Wednesday July 28th	9:00 - 10:00 AM 10:00 - 11:00 AM 11:00 - 12:15 PM 1:15 - 2:45 PM 3:00 - 5:00 PM	Sociobiology Reproduction Population Estimation Behaviour workshop (bring laptop) Group work on project
Thursday July 29th	9:00 - 10:00 AM 10:00 - 11:15 AM 11:15 - 12:30 PM 1:30 - 3:00 PM 3:00 - 5:00 PM	Sensory systems Acoustics TBD Pathology Group work on project
Friday July 30 th (ON CAMPUS)	9:00 - 10:15 AM 10:15 - 12:00 PM 1:30 - 4:00	Culture Acoustics workshop (bring headphones) Necropsy lab
Saturday July 31st	Study Day 5:00 PM Group proposal and datasheets due	
Sunday August 1	9:00 - 11:00 AM 11:15 - 1:00 PM	Final exam Cape Breton ecology
Monday August 2	9:00 AM	Meet at parking lot; Drive to Cape Breton Hike Skyline trail
Tuesday August 3		Charter boat
Wednesday August 4		Charter boat
Thursday August 5		Charter boat
Friday August 6	8:00 AM 5:00 PM	Departure; Return to Halifax Field book due
Saturday August 7	Day off to prepare journal readings, reports, and presentations	
Sunday August 8	9:00 AM 9:00 - 12:00 PM 1:00 - 4:00 PM	Journal questions due Project guidance Journal club

Monday August 9	9:00 - 1:00 PM	Project guidance
Tuesday August 10	9:00 - 2:00 PM	Project guidance
Wednesday August 11	9:00 - 11:30 AM 7:00 PM	Oral presentations 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 four potential projects outlined below. Groups will consist of 3-4 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 Dara and the other demonstrators.

You will be required to hand in your project proposal and datasheets by **5:00 PM on Saturday July 31st**. You will be given feedback the next day so that you can make any necessary changes before leaving for 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 Wednesday August 11.

Equipment available

- Boat, with ship-board depth sounder, thermometer, 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 and possibly minke whales are frequently observed in the area and trips will be tailored to sight these two species. However, we will watch for all marine mammals, including harbour and grey seals, fin 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 Dr. Orbach ASAP of any medical conditions**)

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. Students 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.

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. The full text of Dalhousie's Student Accommodation Policy can be accessed here:

http://www.dal.ca/dept/university_secretariat/policies/academic/student-accommodation-policy-wef-sep--1--2014.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.

The Academic Integrity website (<http://academicintegrity.dal.ca>) provides students and faculty with information on plagiarism and other forms of academic dishonesty, and has resources to help students succeed honestly. The full text of Dalhousie's ***Policy on Intellectual Honesty*** and ***Faculty Discipline Procedures*** is available here:

http://www.dal.ca/dept/university_secretariat/academic-integrity/academic-policies.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. In general:

"The University treats students as adults free to organize their own personal lives, behaviour and associations subject only to the law, and to University regulations that are necessary to protect

- the integrity and proper functioning of the academic and non – academic programs and activities of the University or its faculties, schools or departments;
- the peaceful and safe enjoyment of University facilities by other members of the University and the public;
- the freedom of members of the University to participate reasonably in the programs of the University and in activities on the University's premises;
- the property of the University or its members."

The full text of the code can be found here:

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

SERVICES AVAILABLE TO STUDENTS

The following campus services are available to help students develop skills in library research, scientific writing, and effective study habits. The services are available to all Dalhousie students and, unless noted otherwise, 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 - email Coordinator at: sfs@dal.ca or - Simply 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 coach/tutor to discuss writing assignments (e.g., 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 Centre (Rm G25) and book an appointment - Call (902) 494-1963 - email writingcentre@dal.ca - Book online through MyDal We are open six days a week See our website: writingcentre.dal.ca