**Faculty of Science Course Syllabus**
**Department of Biology**
*Biol 2003: Animal Diversity*
*Fall 2021*

**Why this class?**
How many animal phyla do you see in the following picture (Figure 1)? Are any of them closely related? How do they relate to other animals, such as humans?


Figure 1: Encrusting animals. Photos by L. Gibson (A, & C); cc-sa-by, and J. Frail- Gauthier (B); used by permission.

Are these two animals in the same phyla (Figure 2)? How do we decide what is related? How do we organize these relationships?

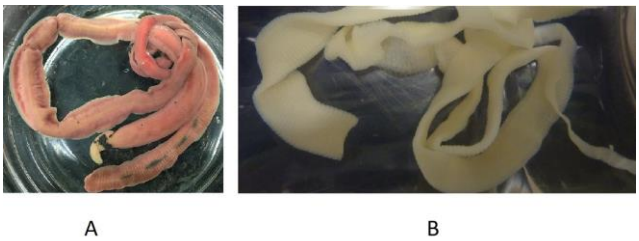


Figure 2: Worms. Photo by L. Gibson; cc-sa-by.

What animals can be found in these three habitats (Figure 3)? Which area is more biodiverse? How can we tell?

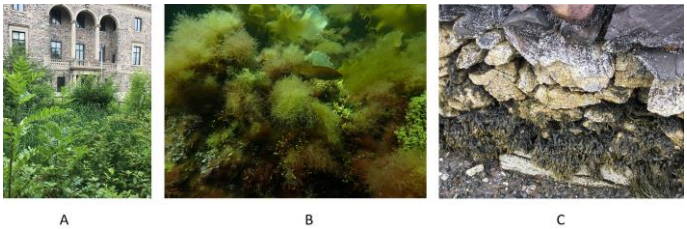


Figure 3: Terrestrial habitat Dalhousie University (A), Subtidal habitat (B), Intertidal habitat (C). Photo by L. Gibson; cc-sa-by.

These are some of the questions that will be addressed in this class, through lectures, discussions, project work, and specimen observation. The course takes a phylogenetic approach, exploring the evolutionary relationships and key transitions between metazoan taxa.

## The Teaching Team

The teaching team for this class includes Jessica Bennett, who will deliver the lecture material, Lara Gibson, who is the class coordinator and laboratory instructor, and very enthusiastic Teaching Assistants (TAs), including Matt (B01), Frankeisha (B02), Marco (B03), Jacqueline (B04), Michaela (B05), and Zaina (B06). Please address all of us by our first names.

## Meet the Teaching Team, Instructors

**Jessica** enjoys spending time in nature and loves spotting interesting flora and fauna while she is hiking and camping around Nova Scotia. Jessica is especially interested in evolutionary history, and she is excited to teach you all about animal form, function, and phylogeny this semester.

If you have a question about the lecture material you can book an appointment with Jessica here, or contact her at J.Bennett@dal.ca

**Lara** almost always has a camera close to hand to take photos both for fun, and to add observations to the iNaturalist database, a global community science project which aims to document global biodiversity and phenology. She is excited to introduce you to community science, the animals found in Nova Scotia, and the study of natural history.

Lara's office is found on the fifth floor of the biology tower, LSC B 5089. If her door is open you are welcome to drop by with questions. She is also available by email at ldgibson@dal.ca. On most Friday afternoon between 1:30- 4 pm, she will host Open Lab, in LSC 2102. This is a time where you are welcome to come by with questions, or take some time to see the lab specimens again.

Lara is also an academic advisor for the biology and marine biology program, if you want to talk about your academic path, she is available on Wednesday from 11:30-12:30. Please book an appointment here. Or email her to book an appointment.

## Meet the Teaching Team, Teaching Assistants (TAs)

**Matt** is a seasoned diver with a serious passion for marine invertebrates and ocean technology! He hopes to one day merge technological innovation and conservation efforts to benefit the global marine ecosystem. He is excited to teach and learn with you this fall as you cover the wondrous diversity found on beautiful Earth.

**Frankiesha** loves to spend most of her time outdoors and observing wildlife. She is excited to be a part of the teaching team because animal diversity was one of her favourite classes and she is looking forward to helping everyone learn the unique characteristics of the animals and add a different perspective of learning.

**Marco** is extremely passionate about the ocean and invertebrate/molluscan biology (which we will learn A LOT about in this course). He is excited to be a TA this semester, since the diversity of life courses were some of his favorites to take in second year. He is excited to help introduce you to the amazing diversity of life, and hopes to instill some excitement in some of the "weirder" and less well known critters!

**Jacqueline** tends to have slower expected hiking times because she always gets distracted by the flora and fauna that surround her. As an enthusiast of all things living, she is eager to assist everyone in unveiling the incredible undercurrents of diversity that nature humbly presents. Unfortunately, she won't be able to replicate David Attenborough's soothing narrations of the course material, but will be able to offer oodles of enthusiasm and guidance!

**Michaela** is a Master's of Marine Management student with an interest in marine protected areas, species conservation and ocean sustainability. She is thrilled to be part of the teaching team for this class since it was one of her favourites while attending Dalhousie as an undergraduate student. She is a skilled environmental educator and is looking forward to working with you.

**Zaina** is known to take too many photos of any wildlife she comes across, sharing fun facts about them with anyone who will listen. She is very excited to be a part of this teaching team and is looking forward to helping you learn about the weird and wonderful creatures around us.

The TAs do not have office hours but will be happy to chat with you during your regular laboratory session.

**Class Delivery**

This year Animal Diversity class will have both asynchronous and synchronous components. The lecture on September 8$^{th}$, and all Friday lectures will occur in person. These will take place in the ROWE Management Building 1028 (A on Figure 4), at 11:35-12:25.

When you attend lecture, you are asked to avoid waiting inside the building (weather permitting), enter the room through the lobby of the ROWE building, fill the room from top to bottom to avoid passing other students, and exit via the doors at the top of the room onto University Ave.

You will be expected to wear a mask while attending lecture.

In addition to the live Friday lectures, two additional lectures will be released on Monday morning. All lectures will be recorded and captioned. The captioned Friday lecture will be released up to 48 hours after lecture.

Laboratory sessions will occur in- person and you are expected to attend each lab session in your registered section. Labs occur in LSC B 2102, beside the McCulloch Museum (B on Figure 4). The day and time of each lab are outlined in Table 1.

Lecture and Lab dates and topics can be found in Table 2. Topics highlighted in grey will be delivered asynchronously.

As you move around campus you may want to visit green spaces, these are marked as 1-4 on Figure 4. 1 & 2 are around the Killam Library, space 3 is the Ocean pond, a freshwater wetland, found between chemistry and biology departments. Space 4 is found between Sheriff hall and psychology, and mimics a forested area.

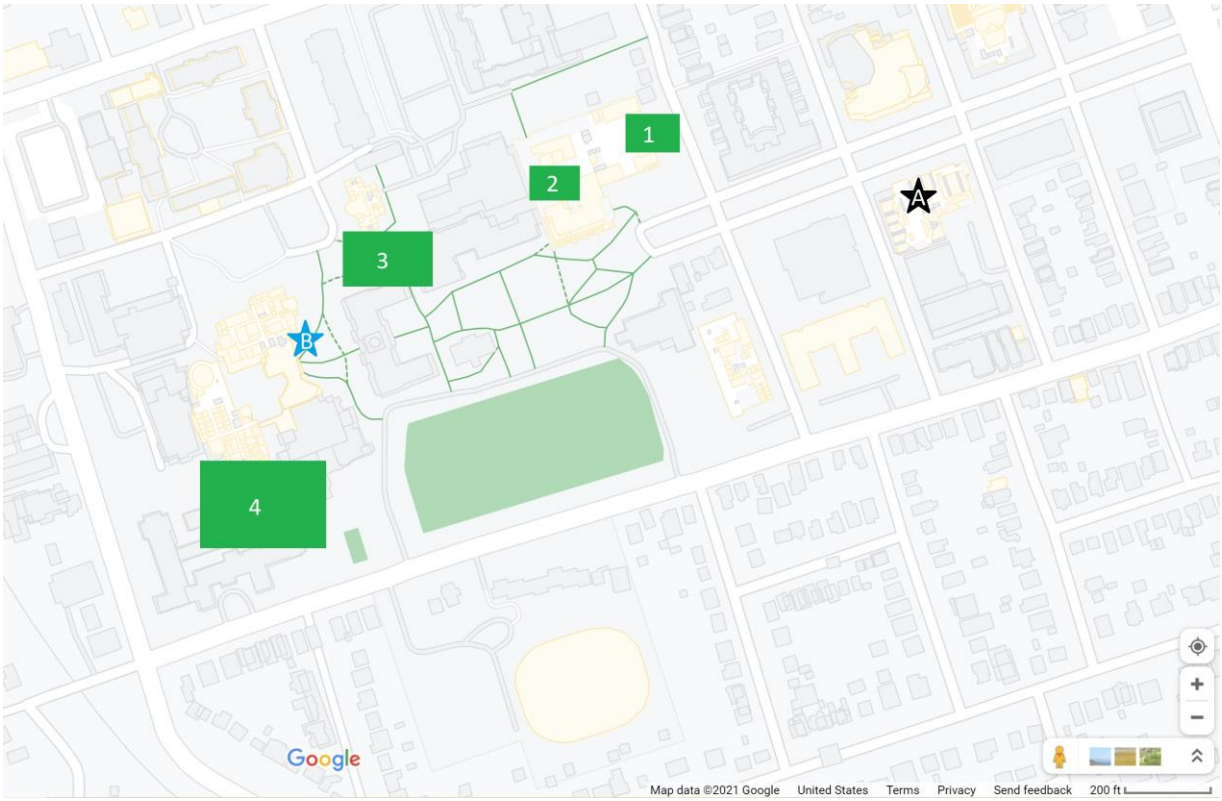


Figure 4: Dalhousie campus with the lecture location at A, lab at B, and a variety of campus greenspaces marked 1-4.

**Table 1** Animal Diversity Lab section, day, time and teaching staff.

| Section | Day | Times | TAs |
|---|---|---|---|
| B01 | Tuesday | 11:35 am – 2:25 pm | Lara & Matt |
| B02 | Tuesday | 3:05 – 5:55 pm | Lara & Frankiesha |
| B03 | Wednesday | 1:35 – 4:25 pm | Lara & Marco |
| B04 | Wednesday | 5:35 – 8:25 pm | Lara & Jacqueline |
| B05 | Thursday | 11:35 – 2:25 | Lara & Michaela |
| B06 | Thursday | 3:05 – 5:55 pm | Lara & Zaina |
| Open Lab | Friday | 2:30-5:30* pm | Lara |
| The day & time for open lab is different for the week of Sep 27- Oct 1. See Table 2. | | | |

**Table 2** Lecture Schedule and Lab Topics by date. Please note 1) Dates in Grey will be delivered asynchronously online; 2) lecture topics may vary slightly by date but test dates are fixed.

| Date | # | Lecture Topic | Laboratory Topic |
|---|---|---|---|
| Sept. 8 | 1 | Class Introduction & Taxonomy (In Person) | |
| Sept. 10 | 2 | Biodiversity | |
| Sept. 13 | 3 | Animal Architecture | 1. Introduction & Habitat Biodiversity |
| Sept. 15 | 4 | Phyla Porifera & Placozoa | |
| Sept. 17 | 5 | Phylum Cnidaria | Friday Open Lab 1:30-4:00 |
| Sept. 20 | 6 | Phylum Ctenophora & Intro to Bilaterian animals | 2. Porifera, Cnidarians, & Ctenophora |
| Sept. 22 | 7 | Phyla Aceolomorpha & Platyhelminthes | |
| Sept. 24 | 8 | Annelida- a true can of worms! | **Dal BioBlitz** |
| Sept. 27 | 9 | Phylum Mollusca (Part 1) | 3. Worms |
| Sept. 29 | 10 | Phylum Mollusca (Part 2) | Open Lab: T 11:30-4:30, W 1:30-4:30, |
| **Oct. 1** | **11** | **TEST 1** | F 1:30-4:00 |
| Oct. 4 | 12 | All the small things (Lophotrochozoa) | 4. Molluscs |
| Oct. 6 | 13 | Non-Arthropod Ecdysozoans | |
| Oct. 8 | 14 | Phylum Arthropoda (Part 1) | |
| **Oct. 11** | | **Thanksgiving No Class** | 5. Arthropods |
| Oct. 13 | 15 | Phylum Arthropoda (Part 2) | |
| Oct. 15 | 16 | Phylum Echinodermata (Part 1) | Friday Open Lab 1:30-4:00 |
| Oct. 18 | 17 | Phylum Echinodermata (Part 2) | 6. Echinodermata |
| Oct. 20 | 18 | Phylum Hemichordata | |
| Oct. 22 | 19 | Introduction to Vertebrates | |
| Oct. 25 | 20 | Phylum Chordata- Tunicates & Cephalochordates | 7. Information Literacy |
| Oct. 27 | 21 | Vertebrate beginnings & early "fishes" | |
| Oct. 29 | 22 | Gnathostomes and cartilaginous fishes | Friday Open Lab 1:30-4:00 |
| Nov. 1 | 23 | Osteichthyes- the bony fishes | 8. Fish & Lissamphibia |
| Nov. 3 | 24 | The origin of tetrapods and the move to land | |
| Nov. 5 | 25 | Lissamphibia- extant amphibians | Friday Open Lab 1:30-4:00 |
| Nov. 8<br>Nov. 10<br>Nov. 12 | | **Study Break** | |
| Nov. 15 | 26 | Introduction to the Amniotes | 9. Amniotes |
| Nov. 17 | 27 | The reptiles (part 1) | |
| **Nov. 19** | **28** | **TEST 2** | Friday Open Lab 1:30-4:00 |
| Nov. 22 | 29 | The reptiles (part 2) | 10. Citizen Science & Review |
| Nov. 24 | 30 | Archosaurs: crocs and dinosaurs | |
| Nov. 26 | 31 | Origin of flight | Friday Open Lab 1:30-4:00 |
| Nov. 29 | 32 | Modern birds (part 1) | 11. Lab Test |
| Dec. 1 | 33 | Modern birds (part 2) | |
| Dec. 3 | 34 | Mammals (part 1) | |
| Dec. 6 | 35 | Mammals (part 2) | |
| Dec. 9 | 36 | Review | |

The open lab sessions are not intended as a 'make up' lab. Instead they are an opportunity to review, ask questions, or work ahead on any lab material. Open lab is held in LSC- B 2102.

**Course Safety**

We are hopeful that the high vaccination rates among Dalhousie's Students, Staff, & Faculty will allow us to deliver a safe in-person teaching experience. You will be required to wear a mask while attending both lecture and lab. In addition, hand sanitizer will be available at each lab bench and several hand washing stations can be found in the lab room.

If you feel ill, or test positive for COVID-19 do not attend any in- person activities. Contact Lara if are going to miss a lab or lecture exam, and appropriate arrangements will be made. If you miss lecture, ensure you watch the appropriate lecture recording.

You are required to have a lab coat for your weekly labs. Due to COVID-19 safety measures we are unable to provide you with a lab coat if you forget yours. Lab coats can be purchased through the bookstore

In addition your conduct in lab is regulated by the Student Code of Conduct. In particular note that members of the university community have a "A right to and responsibility for contributing to a learning environment of mutual respect where the dignity of all members of the University Community is valued."

If the public health situation changes in Nova Scotia, changes to the course format will be communicated through the brightspace page.

**Course Materials**

- Hickman CP Jr, Roberts LS, Keen SL, Larson A, Eisenhour DJ. 2015. Animal Diversity. 9th ed. Boston: McGraw Hill, 479 p.
  Note: It is acceptable to use the 7th or 8th edition of Animal Diversity.

We will be using the 9th edition of Animal Diversity (Hickman et al. 2021) as our textbook. As you are introduced to each group in lecture, there will be a corresponding chapter on each taxa in the textbook. Test questions will be drawn from the material presented in lecture. Older versions of the textbook can be used, but you will need to be aware of when the taxonomy has changed.

Textbooks are available from the bookstore, and you have the option of a physical textbook or ebook version. The textbook will also be placed on course reserve in the library.

- Lab Coat: Dalhousie university policy states that all students will wear a lab coat when attending a laboratory session with potential hazards. Lab coats can be transported to and from lab in a plastic bag.

Lab coats will be required for the weekly in-person labs. These are available through the bookstore.

- Gibson L, & Frail-Gauthier J. 2021. Biology 2003 Animal Diversity Laboratory Manual.

You will also require a lab manual. This will be available to you electronically through the brightspace page. The lab manual will be available both in its entirety, and in weekly sections. You will need access to the lab manual, either through printing or electronically, as you complete the lab.

OPTIONAL:

Sept JD. 2008. A photographic guide to Seashore Life in the North Atlantic, Canada to Cape Cod. New Jersey: Princeton University Press, 224 p.

Kinsely K. 2005. A student handbook for writing in biology. 4th ed. Sunderland: Sinauer Associates. 237 p. (Dalhousie Killiam call number QL 605 P68 1996)

ON COURSE RESERVE AT KILLIAM LIBRARY: The following items will be placed on course reserve in the library.

- One copy of Hickman et al. 9th ed. On 2 hour reserve
- Two copies of Hickman et al. 8th ed. One on 2 hour reserve, one on 24 hour reserve

**Course Assessment:** 55% of your grade is from Lectures, 45% from Labs. Weighting of all assignments can be found in Table 3.

**Lecture Midterms and Final:** There will be two lecture midterm exams on Friday October 1st, and Friday November 19th. Each test is worth 12% of your final grade, and will occur **in-person**, in the ROWE lecture hall, during the regular lecture time. The two midterms are non-cumulative.

The final exam will be scheduled by the registrars office during the December exam period. This test is worth 23% of your overall grade and will be cumulative.

If you are ill for any of the tests, contact Lara at ldgibson@dal.ca. There are no make up tests for the midterms, instead your final will be re-weighted.

**Lecture Quizzes**: The eight lecture quizzes will delivered online through brightspace. Each quiz will consist of five questions, each worth 0.2 marks, for 1 mark per quiz. You will have a 24 hr window to complete the quiz (Monday at 12:01am to Monday at 11:50 pm), but once you open the quiz you will only have 10 minutes to complete the quiz.

The quiz structure is as follows:

- Questions will draw from any of the previous week's lecture material.
- You will have one attempt at the quiz
- You will have 10 minutes to complete the quiz
- Only one question will be presented at a time
- You will only be able to move forward through the quiz, i.e., you will not be able to return to previous questions.

**Table 3** Assessment components, value and due dates. '*' indicate assignment has a group work component. If there are marks in brackets, it indicates the proportion of the mark that is a result of (group work + individual work)

| **Evaluation Component** | **Weight (% of final grade)** | **Due Date** |
|---|---|---|
| Test 1 | 12 | October 4th |
| Test 2 | 12 | November 17th |
| Weekly Lecture Quizzes | 8 | September 20th<br>September 27th<br>October 12th: Note this is a Tuesday<br>October 18th<br>October 25th<br>November 1st<br>November 15th<br>November 29th |
| Cumulative Final | 23 | TBA: During regular exam period |
| BioBlitz Participation | 3 | September 24th |
| Habitat Biodiversity Project* | 5 (4+1) | Sept. 20th to 24th (Results: Brought to lab)<br>October 12th (group outline) |
| Worm Drawing | 1 | October 4th |
| Mollusc Question | 2 | October 12th |
| Information Literacy * | 5 (4 +1) | November 1st |
| Fish Observations | 4 | November 15th |
| Weekly Natural History Pages<br>1) Your place<br>2) Scavenger Hunt<br>3) Species List<br>4) Free<br>5) Drawing<br>6) Free<br>7) Observation to Question<br>8) Free<br>9) Surveys<br>10) Free<br><br>Or<br>Final Class Project<br>1) Project proposal<br>2) Final Project | 1/ page<br><br>Or<br>10 | 1) September 20th<br>2) September 27th<br>3) October 4th<br>4) October 12th<br>5) October 18th<br>6) October 25th<br>7) November 1st<br>8) November 15th<br>9) November 22nd<br>10) November 29th<br><br>Or<br><br>1) September 20th<br>2)December 6th |
| Community Science* | 5 | November 29th |
| Summary Quiz | 10 | November 29th- Dec 3rd |

**Assignment Submission**: Both individual and group assignments will be submitted to brightspace dropboxes, and are due no later than 11:50 on the associated due dates. Most due dates are on Monday, except for where Monday is a Holiday. You are always welcome to submit your assignment early. If you are submitting an assignment on behalf of a group, please ensure that the names of all group members are recorded on the submission.

**Dalhousie BioBlitz**: BioBlitz is university wide event which occurs each September. We are anticipating that this years event will be in- person, on Friday September 24th. To participate you will need to create an account on iNaturalist.ca. More details will be shared closer to the date.

**Natural History Journals OR Final Class Project**: You will choose between completing weekly natural history journal OR a final class project. You will let us know which assignment you choose on September 20th. <u>You cannot do both</u>.

<u>Natural History Journals:</u> For the natural history journals you will be given a general rubric and a topic for each week. These will be submitted on a regular basis and you will receive regular feedback. Completing the natural history journals will allow you to practice your observational and descriptive skills, while exploring a green space of your choice.

If you choose to complete the series of Natural History Journals you will submit your first journal on September 20th.

<u>Final Class Project</u>: The final class project is to produce a piece of work that reflects what you have learned in this class. The form of this project is up to you and your own creativity. It may be a piece of art, a game, a craft, poetry, infographics, a field guides, or a traditional paper. Maybe you would like to give back to your community by adding to Wikipedia pages, or trying your hand at various citizen science projects, or producing education activities for a local school or activity group. This list is not exhaustive, and you are welcome to propose additional ideas. Along with the project you will provide a 2-3 page written reflection on how your project relates to what you have learned in the class. A marking rubric for this project will be shared with you at the start of the term.

If you choose to complete a final project you will submit a project proposal on September 20th.

**Summary Quiz**: You will complete a cumulative summary quiz in the last laboratory session in the week of November 29th- December 3rd. This quiz will ask you to recognize and describe the key transition for the lab specimens. All specimens will have been previously available in lab, and can include partial specimens and slides.

In addition to the specimen identification, the summary quiz will include additional multiple choice questions.

**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) | |

The common grade scale defines achievement of each grade level as follows:

A- to A+: "Considerable evidence of original thinking; demonstrated outstanding capacity to analyze and synthesize; outstanding grasp of subject matter; evidence of extensive knowledge base."

B- to B+: "Evidence of grasp of subject matter, some evidence of critical capacity and analytical ability; reasonable understanding of relevant issues; evidence of familiarity with the literature"

C- to C+: "Evidence of some understanding of the subject matter, ability to develop solutions to simple problems; benefitting from his/ her university experience"

**Biol 2003 WOW Factor**: For each assignment in this course, submitting work which fulfills the requirements of the assignment will earn you a good grade. However, maximum points will only be awarded for exceptional work. Exceptional work can result from presentation, a creative approach, expansion of the content, or linkage of the content to other classes. In short there is no single definable factor that will make your work exceptional, instead it will reflect the criteria outlined in the A- to A+ definition.

When thinking about the 'WOW factor', consider the community you are training to be a part of, ie. a biological scientist. This community values characteristics such as building on the work of others, good experimental design, creativity, clear data presentation and analysis, excellent descriptions, thoughtful observations, and a wide variety of other skills. How have you emulated these skills in your work?

When assigning final grades, the first decimal place will be considered.

**Course Objectives/Learning Outcomes**

It is expected that you have completed and are familiar with the material covered in Biol 1011, or an equivalent course.

The list of skills and topics we expect you to be familiar with at the start of Biology 2003, include:

- Create scientific questions, propose a written hypothesis as a tentative answer to that question and generate observable predictions consistent with that hypothesis.
- Describe basic animal body plans and identify different tissue types.
- Explain why community or food web structure is likely to change if a top predator is removed.
- Explain why small population size is of concern to conservation biologists.
- Provide examples of how biological interactions (competition, predation, mutualism) structure communities.
- Understand the features that allowed transition from aquatic to terrestrial environments.
- Use and know when to make use of common biological research tools.
- Analyze data using basic statistical techniques (mean, standard deviation, n, chi-square test).
- Collect both quantitative and qualitative data through careful observation.
- Describe early developmental processes in sea urchin, frog and humans.
- Describe the form and function of skeletal muscles and cardiovascular, digestive, endocrine, excretory, immune, and respiratory systems, using the human model as an example.
- Interpret animal social behaviour in light of natural selection (costs and benefits).
- Know main animal diet types and adaptation to those diets.
- Report data using written descriptions, graphs, tables, and sketches.

The student learning outcomes, the list of skills and topics we expect you to learn during Biology 2003, include:

- Assess credibility of source material
- Manage group work
- Use dissecting and compound microscopes
- Describe conservation issues facing taxonomic and functional groups of metazoans
- Identify major invertebrate and vertebrate taxa
- Use raw data to produce summary statistics and plots
- Use taxonomic keys
- Associate metazoan phyla with the habitats/environments that they occupy
- Compare classification of metazoans into major clades: protostomes/ deuterostomes, ecdysozoans, lophotrochozoans
- Generalize and appreciate animal diversity on a global scale
- Relate changes in animal systems to transition onto land
- Describe the Geologic history and time-scales associated with the evolution of metazoans
- Compare the variety of invertebrate and vertebrate animal body- form, ecologies, life histories, and physiology
- Relate animal phyla to key transitions on a cladogram

**Online presence**

Brightspace: The course maintains a brightspace page. To access the site start at Dal.ca, click on the brightspace tab on the upper right of the banner. This will bring you to a log on page, which asks for your netID and password. Once you are logged in you should see all pages (links) for any of your classes that have OWL pages.

Twitter: The class maintains a class twitter feed @DalBiodiversity. This account is used to share articles about biodiversity, news from around Dalhousie and the occasional picture. I believe this account is a nice model of how to have a professional social media presence. In the past year I have noted several job ads that required social media skills, so cultivating a professional online persona is something you should consider putting in place.

You are not obliged to sign up to twitter or follow this feed. However this feed is for you if want articles on biodiversity, animals, plants, and the occasional picture. As a general rule we will not follow student accounts (we're sure there are things you want to tell your friends and not us).

LibGuide: The Dalhousie University Science Librarian, Michelle Paon, has put together a subject guide for biology. On this page you will find links to the key databases, relevant books, writing guides, and other useful research tools. You can find the subject guide here: http://dal.ca.libguides.com/biology_2000_level, and as a link on the brightspace page.

## Course Policies

**Late assignment policy:** Assignments are to be submitted by 11:50pm on the due day listed in Table 3. Late assignments will be penalized at 10% per day.

If you cannot submit an assignment due to illness or other valid reasons please alert Lara at the time the assignment is due, and the appropriate arrangement will be made.

**Absences & the Student Declaration of Absences:** It is likely that at some point during the term you will have to miss some instructional time due to illness or other exceptional circumstances. We are not accepting SDA forms. Instead contact Lara for any missed in- person activity, so that appropriate arrangements can be made based on your circumstances.

Lectures sessions will be recorded so if you miss a session you can review the material prior to the lecture quizzes.

If you miss a lecture test you must contact Lara Gibson (ldgibson@dal.ca) as soon as possible. There will not be a make-up test for the midterm, instead the cumulative final will be re-weighted. There will be a make-up test for a missed final exam.

For labs, the ideal situation would be to cover the material at a later lab session. However, most lab sections are full, and it will not always be possible to accommodate requests to attend an alternate lab. The appropriate accommodation will be decided on a case-by- case basis. In all cases you are responsible for the missed material. **Please note**: the Friday Open Lab is not a 'make up' lab.

**Cell phones, & Electronic devices:** Please be respectful of your fellow students and refrain from using your cell phone, laptops, and tablets/ iPad for reasons other than following along with the class powerpoints/ taking notes.

In the past we have watched students play video games, check facebook, and shop for shoes during lecture. These are all examples of activities which should be completed on your own time.

You are encouraged to bring cameras to lab and to share your photos through the OWL discussion board. Having photos of the examined specimens, especially if you review them immediately after lab and add notes, will be beneficial when studying for the summary quiz. In the past students have been fairly successful with taking photos of microscope specimens using their phone's cameras.

**Laboratory rules:** Since the laboratory room is used every day of the week, we ask you to please observe the following:

1. We encourage you to wear masks while you complete the lab work. While the building ventilation has been deemed adequate, you will be working in close proximity with your peers and instructors.

2. At the end of the lab wash and put away any shared equipment to the appropriate areas.

   Ensure equipment and supplies found at your bench are cleaned and returned to your bench.

   Wipe down your bench to make a pleasant working space for the next group (this is especially important on weeks with dissections!!!)

3. Use the appropriate containers to dispose of your waste. There are garbage bins located under each sink on the side benches. This is also where you can find paper towels.

   The drains at your benches are not appropriate places to leave waste or to dump liquids. Dispose of liquids in the sinks on the side of the room.

   Please do not use the taps at the benches, they are unreliable and will flood the bench.

   Sharp items should be placed in the yellow buckets (with the biohazard symbol on them) on the side counter, not in the garbage, where they might pose a hazard to our custodial staff.

4. On the weeks where the lab activity has included a dissection, please put the carcasses in the clear bags at the front of the room.

   The squid and fish are used to feed the crabs and other critters housed in the seawater tanks throughout the remainder of the year, so no more than 4 squid or 2 fish should be placed in a single bag.

   In addition, please ensure that no razor blades or other sharp objects are left/ included in the bags.

**Referencing & Photo Credits:**

Text: When crediting other people's work please use the Name-Date system of the Council for Science Editors (CSE) style. There is a link to the style guide on the brightspace website.

In your work, ANY and ALL statements that were not empirically derived for yourself as part of an experiment or study, for that assignment, must be credited to a source. In text citations should be given as (Name Date), and all sources should be collected into a list at the end of your work and presented in CSE style. Your source list should be in alphabetical order.

A skill you should be cultivating throughout your academic career is to determine the credibility of your sources. The peer review process, where the methodology, results and broader context of an experiment are written up and submitted to other researchers in the same field of study are the most credible forms of published work. Books and documentaries often draw their evidence from the peer-reviewed literature and are edited. These make them credible sources. New articles may or may not be based on peer-reviewed sources and so have varying degrees of credibility. Web sources can be very confusing, some are based on the peer reviewed literature, some are based on people's unsupported opinion or current working theories.

There is a credible checklist flowchart to help you determine the credibility of web sources. A PDF copy of the flowchart document is located on brightspace, under the lab folder. The flow chart was developed based on the criteria outlined by Dalhousie University Librarians.

Please use the flowchart in conjunction with the following table (This will also be posted on brightspace as a word document). As you move through the flowchart add "+" or "-" to your table. As you increase the number of "-" signs the credibility of your site decreases. After you have gone through all criteria you can determine if you site is credible, less credible or not credible.

**Table 4** Summary of online source credibility

| Web Site | 1. Authority | 2. Purpose/ Objectivity | 3. Currency | 4. Accuracy | Overall |
|---|---|---|---|---|---|
| 1. | | | | | |
| 2. | | | | | |
| | | | | | |

If you are using websites as references, please include the table as an appendix to your report.

Photos: Not all photos presented on the internet are available for use. Some were developed for specific companies or sites and require permission or payments for use. However, if you look around you can often find photos that are published with creative commons or educational use licenses.

Good sources for photos published with creative commons licences are:

Wikimedia Commons at http://commons.wikimedia.org/wiki/Main_Page

iNaturalist at either iNaturalist.ca or iNaturalist.org

Avoid using photos that are under copyright or where it is unclear what type of license they are published under.

The name of the creator and the license it is being used under should be placed under the photo, and the full reference as a webpage should be placed in your reference list.

If it is your own photo put your name and either used by permission or own use.

**Taxa & Spelling:** In all assessments students are expected to know and be able to spell the names of taxa discussed in the class. A full list of the taxa you are expected to know can be found on pages 29-31.

**BioBlitz, Animal Observations & Dissections:**

All animal observations and dissections have been approved by the University Committee on Laboratory Animals at Dalhousie University. Activities are completed under permit number l21-16, valid through September 1st, 2023.

The Dalhousie University BioBlitz is taking place under permit number 121-17, valid through September 1st, 2023.

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## Faculty of Science Course Syllabus (Section B)

### 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

# 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

**Dalhouise University Food Bank:** Food Bank — Dalhousie Student Union (dsu.ca)

**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

**Dalhousie COVID-19 information and updates**: https://www.dal.ca/covid-19-information-and-updates.html

## TIPS FOR STUDYING AND SUCCEEDING IN THIS CLASS

This class is a survey of the characteristics of the major animal phyla with an emphasis on their evolutionary history. The key transitions between phyla are emphasized in the invertebrate phyla and the transition to, and adaptation for living on land are the focus in the vertebrate taxa.

The lecture and laboratory material are closely related and you will be exposed to the same taxa in both components of the class. Some weeks you will meet the taxa in the lectures prior to the labs and some weeks you will meet the taxa in labs prior to hearing about them in lecture.

The content for both lecture and lab is patterned on the material in the textbook Animal Diversity 9th ed. (Hickman et al. 2018), which we recommend that you read ahead of both lecture and lab.

When reading the textbook you should be asking yourself:

- Where would I find this animal?
- Can I explain how this animal lives? Ie how do they eat, breath, reproduce?
- What taxonomy do I need to know for this group?
- What are the key transitions for this group?
- Do I understand how this group fits into the overall scheme based on evolution and the key transitions?

As you listen to the lecture recording you should take your own notes. When taking notes, your goal is not to transcribe every word that was said, instead, what are the big ideas that are presented? Make a note of WHEN you do not understand something, so you remember to come back to that concept when you are studying.

Laboratory sessions for this class occur every week, and will generally take the full three hours.

There are two types of labs in this class; most weeks will be observational labs, were you will work with examples of the various taxa. These labs will be set up as stations around the room, and you will move between the stations in twenty-minute intervals. The second type of labs are skills labs, where you will practice skills such as writing descriptions, using taxonomic keys, measuring biodiversity, or using Excel.

The key to a successful lab is to read the lab material ahead of time, and to answer as many of the questions as you can. This way you can spend your time in lab focusing on ideas you find tricky or on interacting with the specimens.

One of the skills we hope you take from lab, is the ability to recognize the organisms you might encounter around Nova Scotia.

At the end of the week you should review both your lecture and lab notes and summarize the animal groups in your own words.

If you are struggling with the laboratory material please come to open lab on Friday afternoons. This is an excellent opportunity to review material and ask questions. Open labs are not designed as 'make up lab' but instead are a combination of office hours and specimen review. Open labs take place in the lab room, 2102, from 2:30-4:30. See the syllabus for the open lab schedule.

**How to Succeed in Group Work**

Many of the lab activities are completed in groups. This is because group work consists of a set of skills which require practice, and when mastered, are desirable to employers. The National Association of Colleges and Employers lists team-work as one of the top 10 skills they look for on applicant resumes (Koncz 2012). Further, Higher Education Strategy Associates, a think-tank focused on post secondary education, conducts monthly polls of Canadian undergraduate students. In 2012, almost half their student panel suggested they wished they had more experience with soft skills, such as managing group work and being self-motivated, after graduating and while looking for a job (Usher 2012). Therefore we feel it is important to give you opportunities to practice these important skills.

The types of skills you will be practicing during group work include: project management, problem solving, negotiation, & effective communication.

There are typically two types of group work, **divide and conquer group work**, and **collaborative** group work. At the start of any assigned project you should be clear about the type of group work that is expected. If you haven't previously worked with your group you should introduce yourself. Along with knowing who you are working with, you need to know what you are expected to accomplish, and skills each member of the group brings to the table. (University of Saskatchewan. N.D.)

There are lots of skills you might bring to a project, including:

- an ability to listen, rephrase, and summarize what others are saying,
- clear and efficient note taking,
- an ability to negotiate between conflicting ideas or working styles,
- an ability to manage deadlines, or
- an ability to edit and format final work

(Centre for Teaching Excellence, University of Waterloo, N.D. a)

Divide and conquer group work will be assigned when there is a large volume of work to complete. Typically this type of group work is often assigned as part of data collection, or at the initial steps in a larger project. To start on this type of project you want to determine what tasks need to be accomplished, who will do which tasks, and what happens as people finish their tasks. If you finish your task before the rest of your teammates you should re-evaluate what is to be done and take on a new task. No one should leave until all tasks are completed. Once all in-class tasks are done, be sure you are clear what, if any, further tasks to be competed, if works should be delegated, and the associated timelines.

In collaborative group work the goal is to bring a variety of perspectives to a project and teams should avoid a divide and conquer approach. Teams should start this type of project by determining what they are being asked to accomplish, and what skills are needed to complete the work. They should then assign roles to each team member. Who will record notes? Who will act as the expert? Who will act as the integrator? Who will act as mediator? Who will report back to the class (if necessary?) (Centre for Teaching Excellence, University of Waterloo, N.D. b). A timeline for the work should also be established at the start of the project.

When assigned group work make sure you can answer the following questions:

- Do you know who you are working with and how to contact them outside of class?
- What type of group work is expected; Divide and Conquer or Collaborative?
- What tasks need to be completed?
- What is the timeline for completion?
- What skills do I bring to the table?
- What other skills are needed to complete the project?
- Who is responsible for each task? Is the work load equitable?
- When will each piece be completed?
- How/ When will peer review be done?

If you are hesitant about group work the Dalhousie Study Skills centre has two workshops “Working in a Group: Getting Started” and “Working in a Group: Moving Forward”. Check the study skills schedule to find out when they are offered.

**A few more study tips –** from Dr. Jennifer Frail- Gauthier.

Active studying involves five acts:

1. Identify the big themes.
2. Elaborate! Think about how the concept you are studying related to other concepts. Think of associations and meanings.
3. Distinct! Think about how the concept you are studying is different than other concepts. Even if the concepts are related to one another, there will still be key distinctions. For example, you may think about ideas in lecture 3, and how they compare and contrast to a group of animals discussed in lecture 8.

4. Make it Personal! How does the concept relate to personal experience? We can remember it better when it has meaning to us.
5. Retrieve it and apply it! How are you expected to use this information on a test?

The following example will walk you through these techniques.

1. One of the big themes in the lab is how animals work. While there are many aspects of how animals work we will focus on how **they obtain oxygen**. (What other topics would fall under how animals work?)

2. Elaborate:

- How do sponges, cnidarian, ctenophores, marine worms, land worms, gastropods, arthropods, echinoderms, fish, amphibians, reptiles, birds, & mammals obtain oxygen?
- Relate obtaining oxygen to the theme of key transitions.
- What do the big themes of obtaining oxygen & key transitions say about the evolutionary nature of animals?

3. Distinct:

- How is the concept of **how animals work** distinct from **key transitions**?
- How is the concept of **key transitions** distinct from the concept of **metazoan evolutionary order**?
- How is the concept of **evolutionary order** distinct from **how animals work**?

4. Make it personal:

- What key transition makes the most sense to you?

5. Retrieve it and apply it:

- Try to write a short answer or multiple- choice question for the upcoming tests.

**Last three points on studying**

1. Practice Testing: Once you think you know a topic, try to turn it into questions. You might be able to describe what you know, but on a test you will be faced with questions (Dunlosky 2013). Attempting to turn what you know into questions will allow you to think about what other information it might be confused with, and therefore what might show up on a test as a distractor. Is the name similar to something else? Is the life history similar but in a different habitat? Are the key transitions the same as another group?

2. Distributive Learning: Instead of learning about each group separately, compare between the groups (Dunlosky 2013). If you always learn about poriferians and then go back and review the poriferians again in isolation, you will struggle when asked to compare poriferians with cindarians.

3. Interleaved Practice: Try to switch up the order you study the groups in. This will help you identify what you don't know (Dunlosky 2013). If you always study fish before reptiles, you maybe tripped up when fish are not on the test and reptiles are.