OCSC 4122 / BIOL 4122 – ADVANCED STUDIES IN MARINE ANIMAL DIVERSITY

1. Description

This course is a version of OCSC / BIOL 4122 modified for delivery to a larger group of students. It is delivered in the same 2-week intensive format and ***students are expected to attend in person*** (all applicable MUN health guidelines will be followed). ***Please note that due to the fast pace of the course and its hands-on nature, it will likely not be possible to make up for missed days***.

The course aims to provide an in-depth examination of cellular, physiological, behavioural and ecological adaptations in marine animals. Lectures are combined with discussions of relevant papers from the primary literature on topics of current interest which may relate morphology, ecology, evolution, natural history, species interactions and practical applications. The hands-on component of the course includes lab sessions and the development of research project proposals.

Learning outcomes

Upon successful completion of this course, you will be able to:

- Discuss adaptations in a diversity of marine animals inhabiting various environments.
- Understand the foundations of scientific research on marine animals.
- Understand and apply basic research principles in marine biology and ecology.
- Assess and communicate the significance and limitations of research results.

2. Evaluation

Research proposals (2X30%) **60%**

Students will be required to submit two research proposals, one at the end of week 1 and the other at then end of week 2. Templates/guidelines will be provided ahead of time and submissions will be made through the Assignments folder.

Oral presentation **20%**

Presentation skills will be evaluated as each student delivers a talk on a species/topic of their choice.

Readings and discussions **20%**

Students will be expected to read assigned papers[1] that will be the topics of daily discussions. Each day, one or several student(s) will be assigned to open/lead the debate by providing a written synopsis of the assigned paper and formulating the first comments to open the general discussion. All students will be required to make subsequent comments in each of the daily discussions. Participation during lab sessions will also be evaluated.

[1]Note that the list of papers will be made available on Brightspace before the start of the course.

News reports (extra credits) **5%**

Students will be given the opportunity to submit up to two summaries (2 pp; single-spaced; worth max. 2.5%) of scientific news or events related to marine science (e.g. from conference, news site, webinar, live event). Summaries should include a clear overview of major ideas/findings presented and a critical assessment of their strengths, limitations, etc., and will be submitted through the Assignments folder. These are essentially free bonus points.

3. Schedule

- **Morning discussions (1-2 h)**: You are expected to have read the assigned paper ahead of time. One or more student(s) will be assigned the lead; they will open the discussion by sharing a ~300-word written summary / assessment, and they will stimulate/moderate the discussion for that paper (each student must be the leader at least once). All students (including lead) must thereafter voice comments/questions on each assigned reading.
- **Morning lectures (1-2 h)**: The instructor will deliver short lectures.
- **Afternoons**: The afternoon periods will be dedicated to lab sessions and self guided work on the major components of the course (oral presentation and research proposals).
- **Other:** Students may schedule one-on-one meetings (remote or in-person) upon request.

DAY	**TIME**		
	9:00-12:00 Discussions & Lectures	12:00-13:00	13:00-16:30 Self Guided Work & Labs
1 22 April	• Presentation of syllabus and TAs. • Review of guidelines. • Lecture I: Diversity overview. • Safety orientation.	Lunch	• Tour of facilities. • Research and identify topics of oral presentation and of Proposal I.
2 23 April	• Discussion on assigned reading 1. • Lecture II: Morphology / colour / light. • Research oral and proposal topics.	Lunch	• Lab Session I: Ecosystem Interactions & Experimental Design • Submit topic of Proposal I by end of class.
3 24 April	• Submit topic of oral presentation. • Discussion on assigned readings 2. • Lecture III: Species interactions.	Lunch	• Work on oral presentation. • Work on Proposal I.
4 25 April	• Discussion on assigned reading 3. • Lecture IV: Regenerative abilities.	Lunch	• Lab Session II: Forms and functions. • Work on oral presentation. • Work on Proposal I.
5 26 April	• Discussion on assigned reading 4. • Lecture V: Life histories Part 1.	Lunch	• Submit Proposal I by end of class. • Work on oral presentation.
6 27 April	Work on Proposal II / Prepare oral presentation / Review journal articles for next week		
7 28 April	Work on Proposal II / Prepare oral presentation / Review journal articles for next week		
8 29 April	• Discussion on assigned reading 5. • Lecture VI: Life histories Part 2. • Q&A (am or pm).	Lunch	• Lab Session III: Reproduction & Development. • Submit topic of Proposal II by end of class.
9 30 April	• Discussion on assigned reading 6. • Lecture VII: Deep sea.	Lunch	• Work on oral presentation. • Prepare Proposal II.
10 1 May	• Discussion on assigned reading 7. • Tips on presentations. • Q&A.	Lunch	• Work on oral presentation. • Prepare Proposal II. • Q&A.
11 2 May	• Discussion on assigned reading 8. • Oral presentations.	Lunch	• Oral presentations.
12 3 May	• Oral presentations (continued if needed). • Work on Proposal II. • Lab cleanup.	Lunch	• Submit Proposal II by end of class. • Deadline to submit reports for extra credits (optional).

4. Textbooks

No textbook required.

5. Suggested Course Resources

McIntyre A. (2010). Life in the World's Oceans: Diversity, Abundance and Distribution. Wiley-Blackwell.

Chapter 2 in: A Short Guide to Writing About Biology. 4th ed., 2001, by Jan A. Pechenik, pp.23-52.

Chapter 10 in: A Short Guide to Writing About Biology. 4th ed., 2001, by Jan A. Pechenik, pp. 212-222.

Additional lists of suggested resources are available on the course shell in Brightspace.

6. Instructor

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Teaching Assistants (TAs): Sara Jobson (PhD candidate), Meliane Deshaies (MSc candidate)

7. Assessment Guidelines

7.1 Research proposals (60%)

You will need to submit two research proposals (one at the end of each week) valued either at 30% each or 20% for Report I and 40% for Report II (best option automatically selected). The topic of the research being proposed is open but must be approved by the instructor by the deadline indicated in the course schedule.

See the *Appendix* for template, tips and grading rubric.

7.2 Oral presentation (20%)

Oral skills will be evaluated as each student delivers a presentation on a chosen marine animal (or group of marine animals). This can either be focused on a species or a broader taxonomic level, depending on the circumstances. The topic must be approved by the instructor by the deadline indicated in the course schedule. The student may present and discuss aspects of the morphology, behaviour, ecology, physiology, and evolutionary biology of the chosen marine taxon. The presentation must include the student's original ideas and views (e.g. highlighting any special interest, current questions, gaps in the knowledge, future areas of research). This presentation should be well grounded in the primary literature (scientific papers) and NOT solely on textbook material.

All presentations must adhere to the allotted time (communicated in class), or risk losing marks.

See *Appendix* for tips and grading rubric.

7.3 Participation (20%)

Evaluation of participation to class activities and discussions will be based on the following criteria:

- ✓ Participation during lab sessions.
- ✓ Level or preparation/involvement in the discussions.
- ✓ Efficacy as discussion leader (when it is your turn).
- ✓ Quality of the written critique (submitted to class and to instructor as a file or hard copy).
- ✓ Quality of comments (arguments, reasoning, vocabulary).

7.4 Extra credits (up to 5%)

Two "extra credit" reports on a seminar/activity/webinar, worth a maximum of 2.5% each, may be submitted. In other words, up to 105 pts can be obtained but the final grade is still shown on a denominator of 100. The extra credits are optional; they are basically free points.

You can prepare an extra credit report based on a conference, webinar, or other event you recently attended, or based on news/information seen on a reputable website (newswire, scientific journal). The event/news/seminar must relate to biological or ocean sciences in some way.

A report must be 1.5 to 2 pages (single-spaced). It will include: (1) a full description and clear overview of the event attended or news report, (2) a clear outline of the major activities/findings, (3) a critical assessment of their strengths and limitations. For this last segment, I want to know what you thought of both the (3a) contents and (3b) the delivery. There will be deductions for grammar and spelling errors.

A maximum of two extra credit reports can be submitted at any time during the course. Submissions will be accepted until 5 pm on the last day of class.

8. Academic Integrity

Academic integrity means taking full responsibility for the academic work you submit for your courses, so that you are evaluated on the basis of your own understanding and effort. It means being honest and honourable in all academic pursuits, even in difficult circumstances. Students are expected to know and avoid academic offences; ignorance of an offence is not an acceptable excuse for committing it. Penalties could include reprimand, reduction of grade, probation, suspension, or expulsion from the University.

For more information:

- Consult the University Regulations for Academic Misconduct (Section 6.12) in the University Calendar.
- Revisit the INTG 1000 course in Brightspace.
- See the undergraduate page about academic integrity.
- See the library page about academic integrity (including definitions and quiz).

Please note that you are expected to adhere to the principles of academic integrity by avoiding the many forms of plagiarism and misuse of artificial intelligence (AI).

- Consult the guide on plagiarism (https://www.mun.ca/writingcentre/understanding-plagiarism/what-is-plagiarism/) – including the FAQ and tips to avoid plagiarism.
- Read about the pitfalls of AI (https://www.library.mun.ca/researchtools/guides/integrity/ai/).

There will be penalties for all academic offences in this course (with possibly broader repercussions).

9. Additional Resources

Please be aware of the in-person and remote supports that Memorial University offers, including (but not restricted to) the following:

- MUNUp is an online hub which hosts supports and services to help all students succeed.
- The QEII library provides access to print, electronic and technology resources, and where you can find a lot of your course resources. The librarians can also help you research your subject.
- The Writing Centre (SN–2053) is a free, drop-in facility designed to help students become better writers and critical thinkers. The Centre also offers online writing tutorials.
- The Student Wellness and Counselling Centre (SWCC) (UC–5000) provides counselling, health, and wellness support for students including primary health care, counselling, health promotion, disease prevention, and wellness education. Services are available online and in person.
- Career Services (UC-4001) in Student Life is central to the learning experience at Memorial. We host career events and programs, and we have career resources to help students along the way. Here you can explore your career options, build work experience, and meet employers. It is never too early (or too late) to get started.
- The Indigenous Student Resource Centre (ISRC) (208 Elizabeth Avenue) supports Indigenous students by creating a welcoming community, by providing an engaging and inclusive space, and by offering an array of programs and resources to ensure success. It also assists the non-Indigenous University Community to walk a good path and build positive relationships with Indigenous peoples.
- The Internationalization Office provides a variety of programmes to support international students' transition to MUNL and to our province. To learn more about the Internationalization Office's supports and services, please connect with our office. There is a staff directory for the Internationalization Office to help you find the supports you are looking for.
- The Student Support Office can provide support to students in distress concerning a financial, academic or personal matter. The Student Support Office can also assist students who wish to raise a concern and seek a resolution to a matter related to their student experience at MUNL. The Student Code of Conduct outlines the expectations of students at Memorial University and provides an avenue to address behaviours that deviate from the Code. The Student Support Offices also coordinates the Non-Academic Appeal procedures for students, who need to raise concerns about a university employee or situation. This process ensures that student complaints are dealt with in a fair and equitable manner.
- The Sexual Harassment Office (Earth Sciences E-6039) prevents sexual harassment and sexual assault through education, mitigates the effects of sexual harassment and sexual assault, and identifies methods for timely resolutions of complaints of sexual harassment and sexual assault which may arise at Memorial University. While working towards a resolution of a complaint, the Sexual Harassment Office can coordinate interim accommodations as necessary.
- Students should also download the Navigate App which is the primary means of booking appointments for the Academic Advising Centre, Student Experience Office, and other centres.
- Reach out to the many Student Clubs and Societies which can help you deepen learning in your discipline or pursue your interests outside the classroom and get connected with others.

10. Appendix – Grading Rubrics & Helpful Resources

10.1 Research Proposal

10.1.1 Tips for preparing your research proposals

The proposal should be 8-10 pages (double spaced), excluding the title page, references and tables/figures.

Title Page

- *Title of the project. The title says what you plan to do. It should be brief (aim for ten words or less) and clearly outline the main point of the investigation. For example: "Effects of temperature on feeding rates of green sea urchins".*
- *Name author with affiliation.*
- *Date submitted*

Abstract *This section provides a brief (~1 page) description of the purpose and objectives of the investigation. It should indicate the questions or hypotheses you will be seeking to answer or test. The abstract enables reviewers to quickly grasp the nature and importance of your proposal*.

Introduction *The Introduction (~3 pages) details the purpose of the project. It usually contains all the background information relevant to the project (explain why this topic is of interest, what studies already exist, and what the gaps in knowledge are, etc.).*

Objectives & Hypotheses *Briefly state (~½ page) the questions or objectives and key hypotheses, and outline the chosen approach (explain how the objectives will be met and the hypotheses tested).*

Materials & Methods *Describe the steps you plan to complete during your investigation, and the methods to be used (~2-3 pages). Be sufficiently detailed that anyone could read this section and understand your proposed protocols and match them to your objectives. It may be helpful to provide a Figure (flow chart, map) to illustrate your study site, study approach, experimental setup; or a Table to list your different study sites or experimental conditions.*

Plan *Present a clear overview of the timeline of your proposed project (~½ – 1 page). Adding a Gantt chart may be useful here to identify milestones (main research segments) and the time ascribed to each (these may include things like purchase of equipment and supplies, laboratory setup, field study, animal or sample collection, subsampling or data collection, data processing, data analysis, writing of research results, etc.).*

Relevance & significance *Briefly (~½ - ¾ page) but convincingly state the relevance (timeliness) of the project, and the anticipated significance of the anticipated findings (this is your final sales pitch).*

References *A research proposal must contain a fairly exhaustive literature review (≥ 15 references), which is presented in the introduction. Support all statements with appropriate citations and make sure to list all references cited. Use a clear and consistent style (see reading assignments for examples).*

Tables & Figures *Tables and/or Figures must be numbered consecutively and labeled with a descriptive caption (the caption appears above a Table, and under a Figure). They can be included in the text where appropriate or at the end of the proposal after the References (Tables followed by Figures). Be sure to refer to all listed Tables and Figures in the text of your proposal.*

Note: You are expected to adhere to the principles of academic integrity – see section 8.

10.1.2 *RUBRIC for grading the project proposals*

Title Page (____/2)

0. Absent
1. Incomplete
2. Complete

Abstract (____/6)

2. Incomplete, not outlining the project purpose and all objectives
4. Fairly complete but missing a few or key aspect (purpose or objectives)
6. Complete and clear

Introduction (____/20)

Background information (___/5)

0. No background info
1. General background info only from class material or textbooks
2. Background info superficial (few sources cited)
3. Background info with expanded explanations, but not complete (< 15 sources)
4. Good background info from at least 15 sources, including primary papers
5. Background info extensive, detailed explanations and diversified cited sources (≥15)

Support (____/10)

0. No sources cited to support statements
2. Citations missing for most statements
4. Citations missing for several statements
6. Citations missing for few statements
8. Most statements supported, but some unclear or inadequate
10. Most/all statements appropriately supported

Organism(s) or system to be studied is/are well detailed (___/3)

Gaps in knowledge identified (___/2)

Objectives & Hypotheses (___/10)

2. Poor statement of project purpose, no clear objectives / hypotheses
4. Adequate statement of purpose, no clear objectives / hypotheses
6. Good statement of purpose, no clear objectives / hypotheses
8. Good statement of purpose and clear objectives + hypotheses
10. Excellent statement of project purpose and clear objectives + hypotheses

Materials & Methods (____/20)

Organization (___/4)

0. No text subdivisions or logical flow
1. Few/unclear subdivisions, weak flow
2. Poorly justified subdivisions, poor flow
3. Good, clear subdivisions, logical flow
4. Excellent, well justified subdivisions, great flow

Use of tables/figures/charts (___/2)
0. Tables/figures would have been useful but were not included
1. Tables/figures were used, but were incomplete or not clear
2. Table/figures were used and were clear, or were not warranted

Completeness of description (___/10)
2. Very minimal/incomplete description of methods, no clear link to objectives
4. Some elements present but many missing, no clear link to objectives
6. Relatively complete description but missing key elements and/or link to objectives
8. Complete description, touching on all objectives, but not always clear
10. Complete and clear description, clearly linked to objectives

Clarity of description (___/4)
1. Largely unclear description of methods (hard to follow reasoning)
2. Mix of clear and unclear segments
3. Largely clear, only minor aspects unclear
4. Wholly clear description of methods (reasoning easy to follow)

Plan (___/8)
2. Unclear or largely incomplete research plan
4. Clear plan, but missing key project segments/milestones
6. Clear, complete plan, but unrealistic timeline
8. Clear, complete, and realistic plan

Relevance & significance (____/16)

Relevance (___/8)
2. No attempt to highlight timeliness / relevance of proposed project
4. Weak relevance, or not well explained
6. Weak relevance, but well explained, or good relevance but not well explained
8. Good or great relevance, well explained

Significance and perspectives (___/8)
2. No attempt to highlight significance of anticipated findings
4. Weak attempt to highlight significance (unconvincing)
6. Good attempt to highlight significance (fairly convincing)
8. Significance of anticipated findings well highlighted, highly convincing sales pitch

References (____/10)

Completeness (___/5)
1. Section on references missing or misplaced
2. Most citations/references incomplete or unclear
3. Some citations/references incomplete or unclear
4. Most citations/references complete and clear
5. All citations/references complete and clear

Style/format (___/4)
1. Several style inconsistencies
2. A few style inconsistencies
3. Style largely consistent

4. No inconsistencies detected

Number/nature of references appropriate (___/1)

Spelling and grammar (____/4)

0. Innumerable typos and/or grammatical errors
1. Many typos and/or grammatical errors
2. Relatively few typos and/or grammatical errors
3. Very few typos and/or grammatical errors
4. No typos and/or grammatical errors

Format (____/4)

Adherence to total length requirements, between 8-10 pages of text (___/2)

Appropriateness of length for each proposal section (___/2)

Total ____ **/100** (two proposals worth a total of 60%)

10.1.3 External resources on writing research proposals

You must adhere to the guidelines provided inside this course, but you may wish to get further insight from the following:

https://www.mhc.ab.ca/services/academicsupport/~/media/a6c5e5b4dc184e8d8c72d72ec7032a2c.ashx

https://www.mcgill.ca/gps/students/progress-tracking/proposals

https://ocw.mit.edu/courses/biology/7-16-experimental-molecular-biology-biotechnology-ii-spring-2005/scientific-comm/lec03_resch_prop.pdf

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3282423/

https://conservationbytes.com/2015/05/04/twenty-tips-for-writing-a-research-proposal/

10.2 Oral Presentations

10.2.1 Tips for preparing your presentation

SECTION (weight)	TIPS
Content (35 pts)	Ask yourself: Is the technical component clear, is the coverage of material sufficient or insufficient, is there a logical flow to the content presented? The presenter should: • Relate topic clearly to audience • Remain on topic • Include sufficient information, scientific evidence • Use authoritative, credible evidence (mainly primary publications) • Clearly cite sources for data shown and assertions made
Organization (35 pts)	Ask yourself: Do you have a clear idea of the different elements of your presentation? Are you using presentation aid(s) – whether slides or props or other aids – in an appropriate and efficient manner (e.g. are the slides overcrowded, the font size too small, do you position yourself adequately, is what you are showing clear)? During the different parts of the talk, the presenter should: • **Introduction** Secure audience attention Clearly establish purpose/topic for presentation • **Body** Use clear organizational pattern (logical flow) Use transitions between points • **Conclusion** Offer a summary of topic/ideas Provide closure (take home message)
Delivery (30 pts)	Ask yourself: Are you speaking too quickly, are you projecting your voice, are you looking at the audience, do you speak in full sentences and in a coherent fashion or do you wander from topic to topic, do you exhibit a good/confident posture? Do you finish your talk within the time allotted? The presenter should: • Effectively use vocal variety in rate and intensity to maintain audience interest • Use appropriate pronunciation, articulation, grammar • Use language that is appropriate to scientific topic and audience • Use physical behaviours that support the message (including appropriate eye contact, facial expressions, gestures, posture, personal appearance) • Adhere to time requirements (making good use of time without going over)

10.2.2 *RUBRIC for grading presentations*

Content – Coverage
Topic was well mastered and covered adequately (good balance between breadth and in depth).
15 13 11 9 7 5 3 1

Content – Support
Arguments and photos/figures/props clearly presented and properly supported where appropriate (e.g. citing sources, credit, for images and statements).
10 8 6 4 2

Content – Logical flow
Presentation flowed smoothly, with logical links between major themes/segments.
10 8 6 4 2

Organization – Introduction / conclusion
Presentation included a clear introduction and a clear conclusion.
10 8 6 4 2

Organization – Structure
Major segments/themes of the presentation were appropriately separated to optimize clarity. Each was devoted an adequate amount of slides/time.
15 13 11 9 7 5 3 1

Organization – Layout / design of visual aids
Slides/images were not cluttered and font size was appropriate, easy to read. Text and images were balanced and adequately chosen to explain/present the material. Props were used adequately.
10 8 6 4 2

Delivery – Clarity
The presentation was enjoyable / entertaining (good pace, voice projection, pronunciation, eye contact, appropriate use/balance of visual aids).
10 8 6 4 2

Delivery – Time
Made effective use of time (not too short), without going over (not too long).
10 8 6 4 2

Creativity
Presentation was creative/innovative while demonstrating a good understanding of topic.
10 8 6 4 2

Total _____ **/100** (worth 20%)

10.2.3 *RUBRIC for grading discussions on assigned readings*

Participation will be evaluated during class activities (lab sessions) and discussions. Part of this grade is based on how you analyzed the various parts of the paper to assess its *strengths* and *weaknesses* (accounting for your level of knowledge). Considering both strengths and weaknesses generally allows a more thorough and more persuasive critique by presenting a balanced view. The critique grade is based on the following criteria:

1. The variety of aspects you analyzed and critiqued (coverage, 2 pts).
2. Your ability to find and present both strengths and weaknesses (balance, 2 pts).
3. How well you supported your arguments (2 pts).
4. Organization: Critical reviews should be coherent and allow the reader to easily follow your arguments. Pay attention to reasoning and transitions between sentences (2 pts).
5. Typos/grammatical errors should be avoided (2 pts)

Total ____ /10

Note: *The way you summarized the paper and moderated the discussion when you were the assigned discussion leader will be weighed into the final mark for this course segment. However, you are expected to be equally well prepared for all discussions.*

Some questions you might consider (of course, not all are appropriate for every paper):

- ✓ Did the title adequately convey the main subject or message of the paper?
- ✓ What was the main objective/purpose of the research, study or work? Did the author(s) meet this objective?
- ✓ As far as you know, did the paper describe new work, new results, or a new theory or interpretation? Or did the paper provide valuable confirmation of previously published information?
- ✓ Were the different sections of the article well balanced? Did the paper read well?
- ✓ Were the methods sufficiently detailed to understand or replicate the study? How adequate were the methods and the controls used?
- ✓ Who was the intended audience? Was the writing style appropriate for this audience?
- ✓ Did the author(s) properly define any jargon they used?
- ✓ Were illustrations, tables or figures used to good effect? Did they complement the text? Were they the best method to present data or were they unnecessary or overly complex?
- ✓ Were the conclusions justified? Was interpretation adequate, or perhaps not fully warranted by the data (e.g. important omissions or loose generalisation).
- ✓ Did the author(s) suggest areas for further research or discussion?
- ✓ What was the size of the reference section? Were recent references included? Were references used for both support and rebuttal? Was proper respect given to pioneer work on the topic?
- ✓ What did you take out of this paper? Any suggestions for future work in this field?