Western Science

Department of Biology

BIOLOGY 3415G - Aquatic Ecology
Course Outline

1. Course Information

BIOLOGY 3415G, Aquatic Ecology, Winter 2026

List of Prerequisites

Biology 2483 - Ecology A/B.

Unless you have either the prerequisites for this course or written special permission from the Department of Biology to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

2. Instructor Information

Instructors	Email	Office	Office Hours

3. Course Syllabus, Schedule, Delivery Mode

Course Description

Aquatic ecosystems cover most of the Earth's surface and play a central role in regulating climate, cycling nutrients, and supporting biodiversity and food production. Many of today's most pressing environmental challenges, including climate change, fisheries decline, harmful algal blooms, and marine conservation, are rooted in aquatic ecological processes. Topics in this course begin with the physical and chemical properties of water that shape aquatic habitats, and progress through the biological processes that structure ecosystems across scales. We examine primary production by phytoplankton, microbial nutrient cycling, secondary production, and food-web interactions linking microbes, plankton, and higher trophic levels. These processes are then scaled up to patterns of movement ecology, biodiversity, species distributions, and ecosystem connectivity, with a focus on how the movement and habitat use of top predators integrate ecological processes across ecosystems. Students will learn about tools such as satellite telemetry, stock assessment, remote sensing, species distribution modelling, and underwater survey methods to study species distributions and movement patterns. The course emphasizes applied aquatic ecology through case studies and hands-on assignments using real ecological data. Students will develop skills in data analysis, critical evaluation of scientific literature, and scientific communication.

Course-level Learning Outcomes

Students will be able to:

- Explain how physical, chemical, and biological processes structure freshwater and marine ecosystems across scales, including the roles of plankton, consumers, and food webs in carbon cycling, climate regulation, and other global processes.

- Compare major aquatic ecosystem types and evaluate human influences on aquatic systems, including fisheries and harvesting, using ecological principles to understand ecosystem dynamics and management outcomes.

- Explain how the movement and distribution of marine species are linked to pelagic and mesopelagic ecosystems, and evaluate how biodiversity patterns, fisheries, and aquaculture influence contemporary and future marine conservation and management decisions.

- Critically evaluate and communicate evidence from primary research in aquatic ecology and conduct exploratory statistical analyses of ecological data.

Course Schedule

Week	Date (m/d)	Lecture	Assessments
1		Course introduction Why water? Water on Earth, water physics and chemistry, searching for research	
2		Freshwater versus marine, ecosystem services and sustainability Participation #1: Case study - Hudson Bay ecosystem	
3		Life in water, primary production, phytoplankton Participation #2: Bloom dynamics	
4		Secondary production, zooplankton, microbial loop, biological carbon pump Participation #3: Distilling a research article	
5		Coastal versus open marine ecosystems, ecological interactions Participation #4: Effects of ocean acidification	
6		Deep sea ecosystems Participation #5: Deep sea biodiversity	Writing Assignment #1 - Research Communication (15%)
		Reading week	
7		Migratory marine megafauna Mid-term – Weeks 1 –to 6 (1.5 hours)	
8		The mesopelagic zone and the deep scattering layers Participation #6: Satellite tracking of marine megafauna	
		Assessing Marine Biodiversity Participation #7: Baited remote underwater video	
9		Species distribution modelling Participation #8: Species Distribution Modelling	
10		Fisheries Participation #9: Stock assessments	
11		Aquaculture Participation #10: Designing marine protected areas	Writing Assignment #2 – Data Analysis Write-up (15%)
12		Dynamic Marine Planning and Management Exam review	

4. Course Materials

All course material will be posted to OWL: https://westernu.brightspace.com/

Students are responsible for checking the course OWL site (https://westernu.brightspace.com/) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class. If students need assistance with the course OWL site, they can seek support on the OWL Brightspace Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Software requirements

As part of the practical component of this course, we will be developing your skills in data analysis and interpretation using freely available and/or open-source software. You will be required to download the following programs:

Microsoft Excel - All of you have access to Office 365 through your Western accounts and can download its desktop applications. You can log into your account with your Western credentials (https://portal.office.com/) and then click on "Install apps" in the top right corner to install Excel on your desktop.

R is a program for statistical computing and data visualization. You can download R here: https://cran.r-project.org/

R Studio is an integrated development environment (IDE) that acts as a code editor for R. It makes working with R a lot more intuitive and provides helpful functions for viewing data and previewing figures. Although you will download R, RStudio is the main program we will use to access R. R Studio: https://rstudio.com/products/rstudio/download/ (Open-source licence).

QGIS is an open-source geographic information systems program (GIS). This program is compatible with both Macs and PCs. You can download QGIS from here - https://qgis.org/en/site/

Please be aware that if you are a Mac user, you will need to ensure that your operating system (OS) is updated to the latest version and you may need to approve the app download in your security settings (see *Tips for First Launch* under the MacOS instructions on the download page.

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Course Component	Weight	Due	Description
Participation	5%		In-class activities
Writing Assignment #1 - Research Communication	15%		Writing to explain and communicate scientific research
Midterm	25%		Short and long answer questions covering the first 6 weeks of classes
Writing Assignment #2 – Data Analysis Write-up	15%		Students will analyze and interpret marine ecological data using R and QGIS and summarize their results in a short report.
Final Exam	40%		Short and long answer including interpretation and communication questions about a pre-assigned research article (cumulative exam)

Participation (5%)

Students will be assessed based on participation and engagement in class activities (in groups or individually), and submission of written answers to short, in-class assignments. These classes will usually occur on Wednesdays, and attendance will be taken.

Participation activities may include:

- Assessing research and writing
- Data analysis and interpretation
- Describing specific processes or concepts
- Group discussion

There are approximately 10 participation assignments that will be graded on a scale of 0 to 3 (0 = not submitted, 1 = incomplete, 2 = complete but poor contribution or answers, 3 = complete and sufficient contribution or answers). There are no extensions or make-ups for these assignments, but you can miss participating in up to 2 activities without penalty. You must participate in at least 4 assignments to receive a participation grade.

The table below lists the likely final participation mark based on the number of participation classes attended and receiving full marks (i.e. 3/3) on the assignments.

# of Participation classes attended with completed assignment	Mark
8-10	5.0
7	4.5
6	4.0
5	3.5
4	3
<=3	0

If you miss more than two of the assignments, you must be granted Academic Consideration to avoid receiving a grade of 0 for the missed assignment. If you are granted Academic Consideration, the weight of the assignment will be transferred to the Final Exam (see Flexible Completion below).

Writing Assignment #1 - Research Communication (15%)
Students are to write a research communication (~ 1200 words) based on 2-4 connected research articles on plankton or the lower food web. This writing assignment will assess the communication of information and ideas, evaluation of evidence, and understanding of concepts in aquatic ecology. The communication will be submitted to Turnitin (see Scholastic Offences statement in Academic Policies below). Details for this Research Communication will be provided in class and via OWL.

Writing Assignment #2 – Data Analysis Write-up (15%)

In this assignment, students will apply quantitative and spatial analysis tools to explore and interpret a marine ecological dataset. Using R and QGIS, students will work with real or simulated marine data to address questions related to marine biodiversity, species distributions, movement patterns, or environmental drivers. Students will complete key steps of the data analysis process, including data exploration, visualization, and basic statistical or analysis. The final submission will consist of a short-written report (~1000 words) supported by figures, maps, and tables generated in R and QGIS.

Midterm (25%)

The midterm exam will and cover material from Weeks 1–6 of the course, including participation activities and course readings, and will be 1.5 hours long taking place during regular class time. The exam will assess students' understanding of key concepts, processes, and case studies introduced in the first half of the course. Questions will consist primarily of short-answer responses, with some longer, integrative questions designed to evaluate students' ability to explain ecological processes and apply course concepts.

Final Exam (40%)

The final exam is **cumulative** and will include questions on all lecture, participation and reading material from the entire course. The format will include mixed questions. The Final Exam will also include communicating the results of a research article assigned at the end of term. The final exam will be scheduled by the Registrar's office for a date in the winter exam session. The final exam is worth 40% of your final mark. The exam will a combination of written and short answer questions and will draw on the material from the entire course, with an emphasis on material from after the midterm (approximately 30% before mid-term, 70% after mid-term). Some questions may test your ability to integrate information from the first and second halves of the course. The final exam will be administered in-person.

General information about missed coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs,* posted on the Academic Calendar: https://uwo.ca/univsec//pdf/academic_policies/appeals/academic_consideration_Sep24.pdf,

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:
https://registrar.uwo.ca/academics/academic_considerations/
All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this and, therefore, always require formal supporting documentation:

- Midterm
- Final Exam, scheduled during the official examination period

When a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

If a student misses more than 2 Participation assignments, there are no make-ups. Academic Consideration must be granted to transfer the weight of these additional (3rd, 4th…) missed assignments to the Final Exam (see Flexible Completion below).

If a student does not submit the Research Communication or the Data Analysis Assignment by the deadline (or any extended deadline by receiving Academic Consideration), the student is still required to submit them, incurring any late penalties that apply. The last date for submissions to be accepted even with Academic Consideration granted is **May 8th, 2026**. After this date, the assignment will be graded as 0, and the student will receive an overall maximum course grade of 45 (see Essential Learning Requirements below).

If a student misses the mid-term (February 25th, 9:30 am), you are eligible to write the make-up (scheduled for March 2nd at 4:00 pm) only if your request for Academic Consideration is granted.

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under Special Examinations), especially for those who miss multiple final exams within one examination period.

Essential Learning Requirements
Even when Academic Considerations are granted for missed coursework, the following are deemed essential to earn a passing grade.

i) Passing grade for the writing components overall, with the average of writing assignments #1 and #2 together being over 50%.
ii) Completion of the Final Exam

Students who do not meet these conditions will receive a maximum grade of 45.

Coursework with Assessment Flexibility

By policy, instructors may deny Academic Consideration requests for the following assessments with built-in flexibility:

Flexible Completion

Participation Assignments. This course has 10 classes with participation assignments and 8 participation assignments with the highest marks are counted towards your final grade. Should extenuating circumstances arise, students do not need to request Academic Consideration for the first 2 missed assignments. Academic consideration requests will be denied for the first 2 missed assignments. Academic Consideration requests may be granted when students miss more than 2 assignments, and these additional (3rd, 4th…) missed assignments will be reweighted to the final exam if academic consideration is granted.

Deadline with a No-Late-Penalty Period

Writing assignments. Students are expected to submit each of their writing assignments by the deadline listed. Should extenuating circumstances arise, students do not need to request Academic Consideration and they are permitted to submit their assignment up to 48 hours past the deadline without a late penalty. Should students submit their assessment beyond 48 hours past the deadline, a late penalty of 10 % per day will be applied. Academic Consideration

requests may be granted only for extenuating circumstances that started before the deadline and lasted longer than the No-Late-Penalty Period (48 hours).

6. Additional Statements

Religious Accommodation
When a recognized religious holiday or observance conflicts with an examination, test, or other scheduled academic obligation, students must request accommodation via the University's Student Absence Portal (SAP). This request should identify the conflict and specify which course component(s) (e.g. test, midterm, exam) are affected.

Students are encouraged to submit the SAP request as early as possible, but no later than two weeks before any examination, or one week before any mid-term test or quiz, to allow sufficient time for adjustment.

The SAP request serves as official notification to both the course instructor and the Academic Advising Office, in accordance with University policy:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

The Faculty of Science considers religious accommodations as scheduling conflicts. Instructors should provide either a make-up exam or an earlier sitting of the same exam to accommodate the student.

For more information on recognized religious holidays, please visit the Diversity Calendar posted on the Equity, Diversity & Inclusion website - https://www.edi.uwo.ca

Academic Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf.

General Academic Policies
The website for Registrar Services is https://www.registrar.uwo.ca/.

Use of @uwo.ca email: In accordance with policy, https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual's official university email address. It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

Requests for Relief (formally known as "appeals")

Policy on Request for Relief from Academic Decision:

https://uwo.ca/univsec//pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf

Procedures on Request for Relief from Academic Decision (Undergraduate):
https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf

Scholastic Offences

Policy on Scholastic Offences:
https://uwo.ca/univsec//pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):
https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a *scholastic offence*, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

Support Services
Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, requests for relief, exam conflicts, and many other academic-related matters: https://www.uwo.ca/sci/counselling/.

Students who are in emotional/mental distress should refer to Mental Health@Western (https://uwo.ca/health/) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts, at:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. If you have any questions regarding accommodations, you may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

Learning-skills counsellors at Learning Development and Success (https://learning.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Additional student-run support services are offered by the USC, https://westernusc.ca/services/.
This course is supported by the Science Student Donation Fund. If you are a student registered in the Faculty of Science or the Schulich School of Medicine and Dentistry, you pay the Science Student Donation Fee. This fee contributes to the Science Student Donation Fund, which is administered by the Science Students' Council (SSC). One or more grants from the Fund have allowed for the purchase of equipment integral to teaching this course. You may opt out of the Fee by the end of September of each academic year by completing the online form linked from the Faculty of Science's Academic Advising site. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the Chair of the Department or email the Science Students' Council at ssc@uwo.ca.