**EEEB S1115 - THE LIFE AQUATIC**

**Department:** Ecology, Evolution and Environmental Biology (E3B)

**Term:** Summer Session II [Q] (Monday, July 8 to Friday, August 16, 2019)

**Time:** Tuesdays and Thursdays from 9:00am to 12:10pm

**Location:** Hamilton Hall, Room 507

**Professor:** Dr. Mercer R. Brugler; **Prof E-Mail:** mb3707@columbia.edu

**Prof Phone:** 337-212-3661 (call or text); **Website:** https://mbrugler.wixsite.com/blackcoral

**Office Hours:** By appointment (please email your professor to schedule an appointment)

**Type:** Lecture; **Credits/Points:** 3

**Drop Course with Refund Deadline:** July 9 - 12

**Drop Course with No Refund Deadline or Select Pass/Fail:** August 5

**Course Description**

Water covers the majority of the earth’s surface but what of the life in these waters? Rivers, wetlands, lakes, estuaries and oceans provide habitat for an extraordinary diversity of animals. This course explores the amazing array of aquatic animals that occupy both freshwater and marine ecosystems as well as the natural and human activities that impact their survival. No previous knowledge of science is assumed. Fulfills the science requirement for most Columbia and GS undergraduates.

Field trip dates: July 18 (Central Park & AMNH [free]) and August 13 (The River Project’s WetLab at Pier 40 [cost: $6 per student; if you cannot afford the entrance fee, please email your professor]). Students pay for public transportation.

We can’t all be Steve Zissou or Sylvia Earl, but we can still explore the life aquatic.

**Goals**

By the end of the course you will gain knowledge of: (1) fundamental ecological concepts, particularly those developed in, and/or related to, aquatic ecosystems; (2) opportunities and challenges for animals in aquatic environments; (3) strategies used by animals to survive in these environments; and (4) impacts of human activities on aquatic ecosystems and how these impacts can be mitigated for conservation of aquatic ecosystems.

**Format**

Course concepts will be explored during class lectures, discussions, individual and group work, and field trips. Laptops can be used by students for taking notes during class, so long as they are not used for activities other than note taking. Cell phones are only allowed when your professor asks you to respond to questions in real time via Kahoot, PollEverywhere, and/or Mentimeter (free programs; no downloads required). If a student is caught using their laptop and/or cell phone for activities not related to class, the offending student will be asked to leave and will be recorded as absent from the class.

**Readings**

No single textbook adequately covers the topics that we will explore from marine and freshwater ecosystems during the course. To gain a deeper understanding of the material covered in class, specific chapters from multiple textbooks and popular science articles will be used as required readings. These readings will be accessible through CourseWorks and thus students do not need to purchase a textbook for this course. Textbooks that are freely accessible as electronic books through CLIO are indicated

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1 Research opportunities at the American Museum of Natural History may be available. Please email your professor for more information.
with blue hyperlinks in the list of readings provided for each class session. However, interested
students are welcome to purchase any of the textbooks if so desired. The three primary texts we will
refer to are:


Dodds, WK (2002). Freshwater Ecology: Concepts and Environmental Applications. ISBN: 0-12-
219135-8 (PB).


These readings will help students to become familiar with new terminology and concepts. The onus is
on the student to complete enough reading to become comfortable with the material introduced in
lectures (and arrange a meeting with the professor if having difficulty understanding any concepts).

Field Trips
We will engage with course concepts through two required experiential learning opportunities that will
take place during class meeting times in NYC via excursions to 1) Central Park + the American
Museum of Natural History, and 2) The River Project’s WetLab at Pier 40.

Assessment
Current event presentation: 10%    Term paper: 15%    Participation: 5%
NYC snapshot video: 10%    Mid-term exam: 20%
Annotated bibliography: 5%    Final exam: 35%

Current Event Presentation
Oral presentations can be daunting, but become less so with practice and learning this skill is
invaluable regardless of your future career path. You will be responsible for locating and presenting
one course-related current event during the semester2. “Course-related” includes: rivers, wetlands,
lakes, estuaries, oceans, aquatic plants and/or animals, impacts of natural and/or human disturbance
on the survival of aquatic organisms, restoration and/or conservation efforts, extinction events, etc. Oral
presentations must utilize PowerPoint, Keynote, or similar software, and last 5 minutes (+ 1 minute for
questions = 6 minutes total). You will be responsible for emailing a link to the current event to your
professor (mb3707@columbia.edu) at least 48 hours in advance of class so your fellow students have
time to review the current event prior to your presentation. Here is a list of websites to help you locate
current events (but you are not limited to these resources): phys.org/biology-news/evolution/,
rubric is available on CourseWorks. If you are unfamiliar with (or need a refresher on) how to create a
PowerPoint presentation, your professor is willing to meet with you individually or as a group (either
in-person before or after class, or online). Please email your professor to set up an appointment.

2 Since there are only 12 classes, and 2 classes are dedicated to fieldtrips, 1/2 class to the midterm, 1 class to the final exam,
and no presentations will be held on the first day of class, that only leaves 7.5 classes to complete 25 student presentations.
Thus, anticipate engaging in 3-4 current event presentations per class.
NYC Snapshot Video
You will be responsible for taking a selfie (still photo or video) of yourself with anything in NYC that you can link with course-related material and creating a 3-minute video presentation on your subject of interest. The subject of interest must be different from your current event presentation and term paper topic. Students typically take one of two approaches: 1) they take a still photo of themselves with their subject of interest, embed the photo in a PowerPoint slide, and then embed an audio recording of themselves discussing their subject of interest; or 2) they record a full 3-minute video of themselves discussing their subject of interest. With regard to the latter option, after you have obtained a 1-2 second video of yourself with the subject of interest, the remainder of the video presentation can take place in any location of your choosing. Either format can result in full credit for this assignment. It is important that regardless of which format you select, your face must physically be in the photo or video (please don’t photoshop yourself into a stock image from the internet). If you are having difficulty thinking of what to do, here are some places that you can visit to get inspired (an entrance fee may be required): American Museum of Natural History (https://www.amnh.org/), NY Aquarium (https://nyaquarium.com/), Central Park Zoo (https://centralparkzoo.com/). If you are interested in visiting the AMNH, your professor can provide you with a free all-access ticket (simply email your professor). **You must obtain approval from your professor prior to proceeding with your selection.** A variety of video presentations from other courses will be shared with the class. The NYC snapshot video is due by 5:00pm on Tuesday, August 13 (there will be a 10% reduction in your grade for each 24-hour period that your video is late). Please email the video directly to your professor, or, if the file is too large, upload it to Dropbox, OneDrive, Google Drive, or similar, and share the file/folder with your professor. If you are unfamiliar with (or need a refresher on) how to create a video, your professor is willing to meet with you individually or as a group (either in-person before or after class, or online). Please email your professor to set up an appointment. Here is a list of free video editors.

Annotated Bibliography
You will be responsible for seeking out at least three primary sources for your term paper, though you can have as many as you would like for your own use (all sources must be from a scholarly journal; you cannot use websites [e.g., Wikipedia] or textbooks). Use consistent formatting (e.g., MLA, ALA, etc.) for each source. State the name of your aquatic animal at the top of your bibliography. Summarize key information (paraphrase in your own words). You can use bullet points or full sentences (whatever is most amenable to your writing process). You must include at least 150 words per reference (= 450 words total). You will be assessed based on adherence to formal formatting protocols (see Purdue writing center website) and paraphrasing of suitable information for the term paper. The annotated bibliography is due by 5:00pm on Tuesday, July 23 (there will be a 10% reduction in your grade for each 24-hour period that your bibliography is late).

Term Paper
The term paper will involve reporting on the ecology of one aquatic animal, selected by each student within the first two weeks of class (your professor will create a shared Google document where you can make your selection known to the class; please refrain from selecting an animal that has already been chosen). This animal will be used as a model organism to apply the concepts learned during lectures (e.g. preferred habitat and food, interactions with other animals, impacts from human activities, etc.). Students should aim for a concise report (2.5 pages of writing, single-spaced, 12 pt font), focused on the animal’s ecology and with a minimum of five supporting references cited. Further details regarding the content and structure of the report will be provided immediately after the first lecture. The term paper is due by 5:00pm on Thursday, August 8 (there will be a 10% reduction in your grade for each 24-hour period that your paper is late).
All assignments will be checked for plagiarism using TurnItIn (or similar software; e.g., PaperRater). I encourage students to scan their assignments on their own prior to submission.

Midterm & Final Exam
Both the midterm and final exam will be a combination of multiple choice, fill-in-the-blank, true/false, short answer, and/or labeling images. One question will be included from each current event presentation (your professor will review the take-home message(s) after each presentation). While the final exam is comprehensive, questions are weighted towards material covered since the midterm.

Quizzes
Two quizzes will be administered during the semester, one prior to the midterm (July 23) and another prior to the final exam (August 8). Quizzes count as bonus points (i.e., each question is worth +1 percentage point) and thus cannot hurt your grade. All bonus points earned will be applied to your midterm (from Quiz #1) or final exam (from Quiz #2). The maximum number of bonus points that can be earned on any single quiz is 5 percentage points (e.g., if you get 5/5 questions correct on Quiz #1 and you score a 90% on the midterm, your final midterm grade will be a 95%). If you miss a quiz because of an excused absence, you will be allowed to take a make-up quiz at a later date.

Participation
All students are required to attend and actively participate in every class with short and relevant questions and comments. Classes are an opportunity to engage in interesting exchanges with your professor and peers, capitalizing on the readings and the material presented in class. This course places a high premium on sustained, high-quality participation. A penalty may be assessed against the final grade of a student who inappropriately disrupts or hinders class activities and discussions.

Positive qualities of participation
- You are alert and engaged, courteous and take notes
- You enter the class discussion offering substantive answers and asking thoughtful questions. Thoughtful questions show that you are prepared (e.g., non-thoughtful question: “I don’t understand anything discussed in the chapter.” What is it that you don’t understand? Do you have a specific example of something that was confusing? What is your interpretation of the topic?)
- You are courteous and take notes

Factors that affect participation negatively
- You are in class, but not engaged. You tune out, check your phone, or disappear behind your laptop screen. You sleep. You have a casual conversation with your neighbor.
- You don’t make eye contact with the professor
- Your try to dominate the discussion and are dismissive
- Your questions are vague. They demonstrate you have not thought deeply about the course materials.

Attendance vs. Participation
- Attendance is a necessary condition for participation. If you miss class, arrive late or leave early, you will not receive full participation points, no matter how stellar you are in class.

If an absence is excused, or is due to religious observance, you will receive participation points for the class that is missed. If an absence is not excused, you will not receive participation points.
Attendance
Attendance and prompt arrival to class are required. Unexplained or frequent absences (i.e., missing >2 classes) and/or frequently arriving late to classes (i.e., >20 minutes after class starts or leaving early, for >2 classes) will result in downgrading of the student’s final assessment. Missing >4 classes without explanation will result in a failing grade for this course. Consideration may be given for documented situations of extended illness or family crisis (documentation should be from the student’s advising dean or continuing education for non-Columbia students; students registered with ODS should privately notify your professor so that appropriate accommodations are made). If you plan to miss any classes for religious observance, please let your professor know their dates before the second class meeting (Thursday, July 11). Your professor will not penalize you for these absences, but may require you to submit any homework and/or take any exams in advance. Attendance is expected during all classes and a component of final grading will be based on each student’s ability to contribute ideas and questions during both group discussions and oral presentations. If unable to attend a class, you will still be responsible for course material covered that day. Students should avoid missing the midterm and final exam as makeup exams will only be provided in extreme circumstances and are generally more difficult than the original.

Plagiarism
Plagiarism involves borrowing or using information from other sources (including internet-based resources) without proper and full credit. Students are expected to quote accurately and identify the origin of citations from others, as well as to acknowledge when ideas are dependent upon concepts developed from other sources. This process of attribution and referencing allows each individual to demonstrate how her or his understanding and ideas relate to an existing body of knowledge - and add to them. It demonstrates the values of academic integrity, and systematic reflection and intellectual development. To do otherwise and not reveal sources constitutes plagiarism. And plagiarism is a form of academic dishonesty. Penalties for plagiarism and/or failing to maintain academic integrity range from a failing grade for a given assignment to dismissal from the university.

3 If you have more than two absences, your course grade will drop by one-third of a letter grade, on a progressive scale. For example, if your course grade was “B+”, with three absences, it will be dropped to a “B”. A course grade of “B+”, with four absences, will be dropped to a “B-”, etc.
Grading System
A = Excellent
B = Good
C = Fair
D = Poor but passing
F = Failure (the grade of F is a final grade and is not subject to reexamination)

Grade point averages are computed on the following scale:

A+ = 98-100%
A  = 93-97.9%
A- = 90-92.9%
B+ = 87-89.9%
B  = 83-86.9%
B- = 80-82.9%
C+ = 77-79.9%
C  = 73-76.9%
C- = 70-72.9%
D  = 60-69.9%
F  = < 59.9%

Writing Resources
Writing center: https://www.college.columbia.edu/core/uwp/writing-center

Reference management and plagiarism information: http://library.columbia.edu/research/citation-management.html

How to write an annotated bibliography: https://owl.english.purdue.edu/owl/resource/614/1/

Sexual Respect
Columbia University is committed to the prevention of gender-based misconduct (e.g., sexual harassment, assault, or discrimination). For further information about such policies, and your rights as a student, please see: https://sexualrespect.columbia.edu/university-policy#rights

Students with Disabilities
Please notify your professor if you are registered with the Office of Disability Services and require special accommodations related to this class so that I can assist in this regard. If you have a disability but have not yet contacted the Office of Disability Services, please do so as soon as possible. For more information visit: http://health.columbia.edu/services/ods

Statement on Academic Integrity
Students are referred to the Faculty Statement on Academic Integrity. Any violation of the school honor code (e.g., cheating on an assignment [e.g., midterm or final] or plagiarizing) will result both in a failing grade for this course and referral to CSA. If you have any questions about what constitutes plagiarism or cheating, please contact your professor for clarification.
http://www.college.columbia.edu/faculty/resourcesforinstructors/academicintegrity/statement
WEEKLY CLASS SCHEDULE

WEEK 1

Session 1: Tuesday, July 9

Introduction

Main Concepts
- Properties of water
- Introduction to the largest aquatic environment on Earth (the deep sea)
- Effective oration and current event presentation design

Required Readings

Further Reading
- Nunez C (2019). *Our oceans are under attack by climate change, overfishing*. National Geographic online.

Session 2: Thursday, July 11

Prime real estate: aquatic habitats

Main Concepts
- Habitat diversity
- Spatial scale
- Conditions and resources
- Linnaean classification

Required Readings
- Allan, JD & Castillo, MM (2007). *Stream Ecology: Structure and Function of Running Waters*, Chapter 1 Section 1.1 (pages 1-12), Chapter 5 Intro (pages 75-76), Chapter 5 Summary (pages 102-103)
- Barnes, RSK & Hughes, RN (1999). *An Introduction to Marine Ecology* Sections 1.1 and 1.2 (pages 1-11)

Further Reading
WEEK 2

Session 3: Tuesday, July 16

Dinner time: energy capture and allocation

Main Concepts
- Primary food sources
- Food webs
- Feeding strategies
- Reproductive strategies

Required Readings

Further Reading

Session 4: Thursday, July 18

Field trip to the American Museum of Natural History
- Meet at Central Park West at 79th St at 9:00am (near the blue/green statue of Teddy Roosevelt on a horse, which is located at the base of the grand staircase leading to the main entrance). If it is raining, take the ramp on either side of the grand staircase and wait below the main entrance.
  - Using microscopes located in the RGGS Teaching Lab, we will view microscopic life that lives in various Central Park waterways (streams, ponds, etc.)
  - Weather permitting, we will utilize the OpenROV Trident to explore waterways in Central Park

Required Readings
- Lindsey R & Scott M (2010). What are phytoplankton?. NASA Earth Observatory.
WEEK 3

Session 5: Tuesday, July 23

Annotated bibliography due by 5:00pm AND Quiz #1

Survival of the fittest and going the distance: heritable traits and movement of populations

Main Concepts
- Morphology
- Behavior
- Physiology
- Migrations and dispersal

Required Readings

Further Reading
- Gibson, RN (2003). Go with the Flow: tidal migration in marine animals. In Migrations and Dispersal of Marine Organisms, pages 153-161

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Session 6: Thursday, July 25

Mid-Term Exam

From mountains to the sea: ecosystem linkages

Main Concepts
- Connections between ecosystems
- Spatial scale
- Challenges and opportunities in aquatic ecosystems
- Term paper structuring

Required Readings

Further Readings
WEEK 4

Session 7: Tuesday, July 30

In the neighborhood: interactions and functional roles of aquatic biota

Main Concepts
- Competition
- Predation
- Facilitation
- Important functions of aquatic biota and ecosystems

Required Readings

Further Reading

Session 8: Thursday, August 1

In case of emergency: natural disturbances

Main Concepts
- Types of natural disturbance
- Effects of natural disturbance
- Responses of biota to natural disturbance

Required Readings

Further Reading
WEEK 5

Session 9: Tuesday, August 6

Oh, the humanity: human disturbances, restoration, conservation

Main Concepts
- Types of human disturbance
- Impacts of human disturbance
- Monitoring, restoration and conservation

Required Readings

Further Reading

Session 10: Thursday, August 8

Term paper due by 5:00pm AND Quiz #2

Historical and global context

Main Concepts
- Evolution and extinction
- Biogeography

Required Readings
- Schoener, TW (2011). *The newest synthesis: understanding the interplay of evolutionary and ecological dynamics*. *Science*, 332(6016), 426-429

Further Reading
WEEK 6

Session 11: Tuesday, August 13

NYC Snapshot Video due by 5:00pm

Field trip to The River Project's WetLab at Pier 40
-Meet at 353 West Street, NY, NY 10014 by 9:30am; rain or shine. The private tour will start at 9:45am and end at ~11:30am. Please download, print, and complete the student waiver form prior to arriving.

Experiencing it all in real life!
Main Concepts
- Synthesis of topics covered to date

Required Reading

Further Reading

Session 12: Thursday, August 15

Final Exam

-While the final exam is comprehensive, questions are weighted towards material covered since the midterm

The contents of this syllabus are subject to change. Your professor will announce all changes via email (mb3707@columbia.edu) so please check your Columbia University email account daily for updates.