R by the Sea: Data Analysis in the Marine Sciences
MEFB 633 / BIOSM 2350
Summer terms at Shoals Marine Lab

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Syllabus & Schedule

Time and Place:
Lecture/Computer Lab course for a total of 4 credits over two weeks at Shoals Marine Lab. The first week of the course is online and the second week takes place on Appledore Island.

Office Hours: TBD

Course Description: Introduces students to the basic data analysis and programming tools commonly used throughout the life sciences. Students will become proficient in R programming, data wrangling and cleaning, the principles of open and reproducible science, building maps, and basic statistics, including linear regression. Data sets and case studies from historic data at the Shoals Marine Lab (e.g., intertidal count data, video fisheries observations, marine mammal censuses). Students will also collect data while at the Shoals Marine Lab. The class culminates with a small group project analyzing a dataset, writing up findings in R markdown, and presenting to the course.

Learning Outcomes (more specific): By the end of the course, students should be able to:

- Understand and implement best practices for data management
- Compare and contrast different tools for data management (Excel, SQL, etc.)
- Use R statistical software for basic data cleaning and statistics
- Use R markdown to build reproducible workflows and documents
- Understand data ethics, especially related to data related to vertebrates
- Load, clean, and plot simple spatial data in R

Textbooks and course materials:
I do not assign any textbooks for my courses. Therefore, I provide all the necessary readings (mostly peer-reviewed scientific publications) for the course and make them available online through Canvas. I will also post the lecture slides on Canvas. All course materials (e.g., R, Git, etc.) are open-source and freely available.

Assignments and Evaluation:

Assignment	Percent of Grade
Lab assignments (10 total)	60%
Final project	20%
Participation	20%

- *Lab assignments*: Each week, there will be a lab assignment corresponding with that week's lecture material. Each lab assignment will consist of a series of challenges involving data sets from across the life sciences. Students will prepare their assignments using R markdown and submit them via Canvas. These will mostly be completed during class time in small groups.
- *Final project:* The lab assignments described above build on one another to provide all the computational skills needed to complete a stand-alone research project. The culmination of the class will result in a small group research paper using a data set of the groups choosing. Each group will also deliver a brief presentation of their paper.
- *Participation:* Points will be given out for both "in-class" discussion participation as well as discussion in online forums.

Grading:
The grading scale for this course is:

100	- 94.00 A
93.99	- 90.00 A-
89.99	- 87.00 B+
86.99	- 83.00 B
82.99	- 80.00 B-
79.99	- 77.00 C+
76.99	- 73.00 C
72.99	- 70.00 C-
69.99	- 67.00 D+
66.99	- 63.00 D
62.99	- 60.00 D-
<59.99	F

The maximum possible grade on any assignment will drop by 10% for every day it is late. Weekends count. There are no makeups or extra-credit options. I have a policy of dropping the lowest score on the weekly lab assignments.

Week 1: Online lecture from 9am – 12pm daily with assigned group work in the afternoon.
Week 2: Full day classes (8am – 8pm) at Shoals Marine Lab. Depending on weather, morning will be in a computer lab setting, afternoons will be in the field, and evenings will be back in the computer lab.

Tentative Schedule

Day	Topic(s)	Reading/Assignment Due
1 (Mon, May 29th)	Introduction to R, open science, reproducibility Building documents using Knitr	- Download R and RStudio (https://rstudio-education.github.io/hopr/starting.html) - Allen, C. and Mehler, D.M., 2019. Open science challenges, benefits and tips in early career and beyond. *PLoS biology*, *17*(5), p.e3000246.
2	Data entry, storage, formatting, and using open refine	- Lab assignment 1 due
3	Pulling in data, building simple plots	- Lab assignment 2 due
4	Data subsetting and filtering	- Lab assignment 3 due
5	Database management and different types of data formats	- Lab assignment 4 due
6	R for reproducible science I (Control flow and vectorization)	- Lab assignment 5 due
7 (Sun, Jun 4th)	No class - transition to island	- No lab assignment due
8	R for reproducible science II (regression)	- Lab assignment 6 due
9	R for reproducible science III (Creating plots in ggplot)	- Lab assignment 7 due - Submission of final project topics and team composition

10	R for reproducible science IV (dplyr, tidyr)	- Lab assignment 8 due
11	Working with spatial data (underwater video fisheries surveys case study)	- Lab assignment 9 due - Read Schell et al. 2020. The ecological and evolutionary consequences of systemic racism in urban environments. Science, 369(6510).
12	Data ethics (marine mammals case study)	- Lab assignment 10 due
13	Time series issues (intertidal data case study)	None
14	Advanced regression tools	Draft of R markdown document due
15	Final project presentations	- Final project slides and R markdown document due

All information on this syllabus and schedule is subject to change as the course evolves during the semester.

Course policies and expectations

Classroom Behavior Expectations: To ensure a climate of learning for all, disruptive or inappropriate behavior may result in exclusion (removal) from this class. As a reminder, cell phone/pda, etc. use, including text messaging, and videotaping and recording is not permitted in this class by Faculty Senate rule unless by instructor permission.

Communication Policy: If you have questions about anything related to the course, please email: Easton.White@unh.edu. If you need to contact me about a personal or confidential matter (e.g., disability accommodations), please e-mail me directly. I will make every effort to answer your emails promptly, but email replies may take up to 24 hours during the week and 48 hours over the weekend.

Attendance: Class attendance is required. However, if an emergency arises or if the weather is bad, please don't come to class and instead let me know so we can make alternative arrangements.

Cooperation/cheating: In general, I encourage you to work and study together. There are a lots of small group assignments. I enforce a zero-tolerance policy with regard to plagiarism. There are no exceptions or excuses. If you plagiarize in this class, you will fail the course and there will be a letter placed in your file in the Dean's Office documenting the reason. UNH's policy on Academic Honesty is included in the latest edition of "Student Rights, Rules, & Responsibilities" (http://www.unh.edu/student-life/academic-honesty-policy).

Disability Accommodations: According to the Americans with Disabilities Act (as amended, 2008), each student with a disability has the right to request services from UNH to accommodate his/her disability. If you are a student with a documented disability or believe you may have a disability that requires accommodations, please contact Student Accessibility Services (SAS) at **201 Smith Hall**. Accommodation letters are created by SAS with the student. Please follow-up with your instructor as soon as possible to ensure timely implementation of the identified accommodations in the letter. Faculty have an obligation to respond once they receive official notice of accommodations from SAS, but are under no obligation to provide retroactive accommodations. For more information refer to www.unh.edu/studentaccessibility or contact SAS at 603.862.2607, 711 (Relay NH) or sas.office@unh.edu.

If you are having academic difficulty, you should visit the **Center for Academic Resources** (CFAR) in Smith Hall (on Main Street by Stoke Hall, phone 862-3698; or https://www.unh.edu/cfar). They have a variety of written materials that will help you develop effective study skills, including note-taking, planning your study time, exam skills, how to take different kinds of exams, and how to study for different exam types. This is an

extremely valuable source of information for students. The Center also has counseling and training sessions tailored for individuals and groups.

Your academic success in this course is very important to me. If, during the semester, you find emotional or mental health issues are affecting that success, please contact Psychological and Counseling Services (PACS) **(3rd fl, Smith Hall; 603 862-2090/TTY: 7-1-1)** which provides counseling appointments and other mental health services.

The University of New Hampshire and its faculty are committed to assuring a safe and productive educational environment for all students and for the university as a whole. To this end, the university requires faculty members to report to the university's Title IX Coordinator (Donna Marie Sorrentino, dms@unh.edu**,** 603-862-2930/1527 TTY**)** any incidents of sexual violence and harassment shared by students. If you wish to speak to a confidential support service provider who does not have this reporting responsibility because their discussions with clients are subject to legal privilege, you can find a list of resources here (privileged confidential service providers/resources). For more information about what happens when you report, how the university considers your requests for confidentiality once a report is made to the Title IX Coordinator, your rights and report options at UNH (including anonymous report options) please visit (student reporting options).