BIOL 465 Syllabus
Global Biodiversity and Macroecology

INSTRUCTOR

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Meeting Time:
T Th 9:45 – 11:00
Class meetings on Zoom

Office Hrs:
By appointment

THIS IS NOT A NORMAL SEMESTER!

The covid-19 pandemic is affecting every aspect of our lives, and this semester may bring unexpected challenges. If you are encountering any problems that interfere with your ability to participate in the class (e.g. related to technology, living situation, health, family) please reach out and I promise to work with you to try to find solutions or accommodations.

SUMMARY

In this course you will learn about the distribution of biodiversity on planet Earth, but more importantly, you will learn to think about these and other patterns in the context of statistics. Macroecology is a way of studying the relationships between organisms and their environment that involves characterizing and explaining statistical patterns of abundance, distribution, phenotypes, and diversity. As we explore these patterns, we will learn statistical tools that can help us to understand them, and you will gain experience in programming and data analysis.

COURSE DELIVERY

Our course will meet during the scheduled class periods online via Zoom at this link: https://unc.zoom.us/j/99240919874, also accessible from the Zoom link on the course's Sakai page. Instruction will be synchronous, meaning I expect all students to attend the live class sessions so that they may participate in discussions and in-class activities. All class sessions will be recorded, and recordings will be posted online under Sakai Resources. Please use your UNC email when registering your Zoom account.

Zoom Etiquette

- *Cameras on, if possible*. There are valid reasons to turn your camera off (e.g., low internet bandwidth, privacy issues), but it is much easier for me to gauge how well you are understanding the material, and it is easier for your fellow students to engage in discussions with you, if your camera is on.
- *Make yourself heard*. In the video conference format, even with cameras on, it is harder for me to know when you might have a question or comment, or whether you are having trouble with a concept. So please use any of these strategies to help get my attention:
    - *Speak up and interrupt me*! I want to be interrupted, especially if I am not being clear in how I am presenting material, or if my audio or video is breaking up.
    - *Use the chat*. Feel free to post questions or address other students' questions in the chat. I will eventually check it and respond, but probably not as immediately as if you asked the question out loud.
    - *Use the "raise-your-hand" button*. Once I notice this, I will stop and allow you to ask your question. But if I don't seem to notice, then just break in and interrupt me!

- *Microphone muted when not speaking*. Your microphone will be muted by default upon joining the session. To minimize the distractions from background noise, please remember to re-mute your microphone after you are done speaking.
- *Use a virtual background if necessary*. If you have roommates or other visually distracting activity going on behind you, you can select a background image for use during the call.
- *Introduce yourself in breakout rooms*. We are a relatively small class, and will regularly be broken up into small breakout rooms on Zoom for discussion or activities throughout the semester. Especially in the first few weeks of the semester, be sure to start out a breakout session by introducing yourself to students that you haven't met yet.
- *Be respectful*. Everyone should feel comfortable expressing their opinions.

TEXT
There is no required text for this course. Required readings will be posted to Sakai as PDFs.

SOFTWARE
Throughout the course we will use the statistical programming language ***R*** for data analysis and visualization which we will interact with using **RStudio** via UNC's Open OnDemand online platform (refer to the separate handout for Getting Started with Open OnDemand and RStudio). Students do not need any prior knowledge of R to take this class. We will spend approximately one class per week programming and doing data analysis.

EVALUATION
Course grades will be based on a combination of assignments, a research paper, an oral presentation, and participation as outlined below.

***ASSIGNMENTS** (60%)
You will have in-class and take-home assignments almost every week throughout the semester. Collectively, they will account for 60% of your grade. Unless specific arrangements have been made with me, individual assignments turned in late to Sakai will be penalized 10% per day. I will drop your lowest assignment score in the calculation of your final Assignment grade.

***RESEARCH PROJECT** (30%)
Students will work in groups of ~2-3 to complete a research paper at the end of the semester that introduces a macroecological research question, and involves the novel analysis of an ecological dataset including R code, figures, and discussion. More information on this assignment will be provided later in the semester.

***RESEARCH PAPER PRESENTATION** (5%)
You will present a short presentation summarizing your research findings to the class over Zoom.

***CLASS PARTICIPATION** (5%)
Class meetings will involve discussion of the reading and of the new material presented. Participation in these discussions is a critical component of this course. *As part of the participation grade, students are also expected to post on Sakai questions or issues for discussion based on the reading by midnight prior to each class.*

TOPICS AND READINGS

The next page has the tentative schedule of topics and assigned readings. Readings may change from what is listed here, but will be posted on Sakai no later than one week before each class.

COURSE GOALS

By the end of the course, students will

- be able to describe basic global patterns of biodiversity and summarize the major hypotheses for such patterns.
- be able to provide evidence in support of each of the major hypotheses for richness patterns.
- be able to describe and interpret the first four moments of a distribution.
- be able to perform and interpret linear regression multiple regression, ANCOVA, variance partitioning, and t-tests.
- know the assumptions behind the above statistical methods and how to evaluate them.
- understand the theoretical and empirical relationships linking abundance, distribution, body size and niche breadth.
- be able to define the concept of allometry and provide examples.
- be able to describe the consequences of a sublinear scaling of organismal metabolism and body size.
- be able to describe the ways in which humans are similar and different from other organisms with respect to macroecological patterns.
- be able to characterize the constraints on and impacts of human societies within the Earth's ecosystem.
- be able to synthesize diverse sources of information statistically, and interpret results in the context of general macroecological research questions.

FEEDBACK

I welcome feedback on ways to improve the class experience. You are welcome to email me directly, or you can provide anonymous feedback using this Google Form. If there's something that's going well, let me know and I'll try and do more of it. If there's something that's going poorly please let me know specifically how you'd like to see the issue fixed/changed/generally addressed. I may not be able to make every change you suggest, but unless you tell me there's a problem, I won't know.

Disability Services Information

If you have a medical condition/disability that may require reasonable accommodation to ensure equal access to this course, please contact the Department of Disability Services at 919.962.8300, on the internet at http://disabilityservices.unc.edu/eligibility or via email at disabilityservices@unc.edu

Honor Code Information

The University of North Carolina at Chapel Hill has had a student-administered honor system and judicial system for over 100 years. The system is the responsibility of students and is regulated and governed by them, but faculty share the responsibility. If you have questions about your responsibility under the honor code, please bring them to your instructor or consult with the office of the Dean of Students or the Instrument of Student Judicial Governance. This document, adopted by the Chancellor, the Faculty Council, and the Student Congress, contains all policies and procedures pertaining to the student honor system. Your full participation and observance of the honor code is expected. If you require further information on the definition of plagiarism, authorized vs. unauthorized collaboration, unauthorized materials, consequences of violations, or additional information on the Honor Code at UNC, please visit http://honor.unc.edu*.*

BIOL 465 Schedule of topics

Date	Topic	Assigned reading	HW
***Biodiversity**			
8/11/2020	Course goals; A brief history of life on Earth	Simpson & Kiessling 2016; video	
8/13/2020	Richness patterns	Lomolino et al 2017; video	survey
8/18/2020	Intro to R		HW 1 due
8/20/2020	Equilibrium and limits to species richness	2 Papers: Ecological Limits vs No Limits	
8/25/2020	Phylogenies, speciation, and extinction	Morlon 2014	
8/27/2020	Phylogenies in R		HW 2 due
9/1/2020	The species-area relationship, linear models	Rosenzweig 1995	
9/3/2020	ANCOVA, multiple regression		HW 3 due
9/8/2020	Island biogeography	Simberloff 1976	
9/10/2020	Variance partitioning, local vs regional determinants of diversity	White & Hurlbert 2010	HW 4 due
9/15/2020	Species invasions and global biodiversity	Sax et al 2002	
9/17/2020	Visualizing distributions, t-tests	Matejka & Fitzmaurice 2017	HW 5 due
9/22/2020	Tropical niche conservatism	Wiens & Donohue 2004; Wiens et al 2009	
9/24/2020	Debate prep	Cornell 2013	HW 6 due
9/29/2020	Debate		
***Macroecology**			
10/1/2020	Intro to macroecology: patterns and constraints	Brown 1996, Ch 1-2	Project survey
10/6/2020	Finding macroecological datasets		HW 7 due
10/8/2020	Patterns in abundance: across space and species	Brown 1996, Ch 4	HW 8 due
10/13/2020	Data manipulation in R	Wickham dplyr tutorial, video	Proposal due
10/15/2020	Allometry: metabolism, body size & temperature	Brown et al. 2004	
10/20/2020	Patterns in body size	White et al. 2007	HW 9 due
10/22/2020	Macroecology of disease	Stephens et al. 2016; Skorka et al. 2020	Revised proposal
10/27/2020	Macroecology of humans	Burnside et al. 2012	
10/29/2020	Research project: working on your analysis		
11/3/2020	Writing peer review: Introduction draft		Intro due
11/5/2020	Research project: working on your analysis		

11/10/2020	Human energy budget	Haberl et al. 2007	
11/12/2020	The future of biodiversity I	Dirzo et al. 2015; Ceballos et al. 2020	HW 10 due
11/17/2020	The future of biodiversity II	TBA	PAPER DUE 11/17
11/20/2020	FINAL EXAM at 4:00 PM		Presentation