

WIS 6934 - Biodiversity

Linking biodiversity patterns and processes across scales of space and time

T 1:55-2:45 & Th 1:55-3:50, MCCB G108

Fall 2018, 3 credits

Instructor: Dr. Morgan Ernest

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Email (preferred mode of contact): skmorgane@ufl.edu

Website: skmorgane.github.io/biodiversity-course

Office Hour: Tuesday 3-4 or by appointment

Prerequisites: None

DESCRIPTION/ORGANIZATION

Biodiversity emerges from a combination of ecological and evolutionary processes operating across many scales of space and time. This course examines the concept of biodiversity and the processes that generate important patterns of biodiversity in ecology.

COURSE OBJECTIVES

- Define the dimensions of biodiversity through discussion and reading the primary literature
- Discuss patterns of biodiversity from the literature and how they relate to ecological processes
- Use current literature to assess current gaps in our scientific understanding of biodiversity
- Design research questions to gain experience with addressing and communicating gaps in scientific knowledge
- Design a presentation to communicate to an audience of broad backgrounds

TEXT AND REQUIRED SUPPLIES

- There is not a required or recommended text book for this class
- Readings for this class come from journal articles available electronically through UF journal subscriptions. Links to papers are made available through the course website (skmorgane.github.io/biodiversity-course).
- Laptops: On specific days (noted on the course schedule) laptops or tablets will be required to participate in literature search and basic computational activities. If you do not have a laptop or tablet, please let the instructor know and access to one can be arranged.

- Software: We will be using R (a freely available statistical programming environment) to learn about quantitative approaches to studying biodiversity patterns. R is required. It is also recommending that student load RStudio – a freely available integrated programming environment – which makes working with R more user friendly.

COURSE POLICIES

Attendance Policy: Life is complicated and sometimes unpredictable. Grading (see below) is structured so that students may have up to 2 excused absences without impacts on grades. Excused absences must be consistent with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation. Additional information can be found here: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

Additional missed discussions can be made up by providing written answers to the questions assigned for the readings for the day(s) missed.

Class Conduct: Because this course is discussion-based, an effective learning environment is critically dependent on all students feeling safe and supported in the classroom so that everyone feels comfortable engaging in discussion. I will do my best to foster an open and positive environment for all students but to achieve this I need students to engage in discussions in a constructive and positive manner and listen to other points of view with an open-mind. It is okay to disagree with me or your classmates, and discussions on differing points of view are enthusiastically encouraged, but must be done with empathy for the other people in the classroom. Sometimes we make mistakes during discussion because we did not think sufficiently about our word choice and that is okay. When this happens, students are expected to apologize sincerely to the affected person.

GENERAL COURSE STRUCTURE AND EXPECTATIONS

This course is designed to provide advanced training for graduate students in a specialized area of ecology. This course is a mixture of lecture, class discussion of primary literature, hands-on experience through class activities, and a major project. While there is some lecturing, class participation, intellectual engagement with topics, and discussion participation are the main ways students will learn in this class. The first hour of Tuesdays and Thursdays are devoted to lecture and class discussions. You are expected to come prepared to discuss the assigned papers. The second hour on Thursdays are devoted to either class activities or working on group projects.

Course Grading

60% of grade will be based on a class project and presentation (330 points), 40% will be based on class participation in discussion* (220 points, 10 points/class day).

*Students uncomfortable with the expectation of participating in a graduate discussion should talk to me about a written alternative.

Class Project Information

Objectives:

- To work collaboratively to identify problems that needs to be solves and devise a plan for solving them
- To apply the knowledge of biodiversity that students are gathering in class
- To gain additional depth on a biodiversity topic
- To practice the use of creativity in science

Implementation:

A considerable amount of class time will be devoted to the class project. Unless told otherwise, in-class projects days are to help reduce the out-of-class time load of the project and to make sure that your group has access to me if needed.

Small groups of 3-4 people will work together on a class project. The group will need to identify something we don't understand about biodiversity. The group will need to devise a plan for filling that gap in knowledge. Plans do not need to be based on what we are capable of doing currently in ecology, but can speculate on new technologies that could be leveraged to answer the question. Plans should identify what the ideal data to answer the question would be (even if that data does not currently exist).

Groups will present in class their project at the end of the semester. Presentations will need to introduce the audience to the current state of knowledge on their topic. Explain clearly what we currently do not understand about that topic. Present their idea for how to fill the current gap in knowledge.

Presentation Guidelines:

Presentation Length: 15 minute presentation plus 5 minutes for questions

Checklist:

- Can you give a short overview of your topic area - what is it and why is is important to study
 - E.g. If you're interested in trait clustering in communities, then you should be able to explain why the field has been interested in understanding patterns of trait clustering and what's our current understanding of trait clustering in communities (this last part should/will set you up for the next part).

- Can you explain clearly what we don't yet understand and why we really need to understand it
 - E.g. what about patterns of trait clustering to we not understand? Why is this gap in our knowledge important? If we can solve this can it help us understand a theory of ecology, design better experiments or conservation policies, or something else?
- Can you explain why we don't understand this thing yet (what has prevented us from already solving the problem you've identified)
 - E.g. Do we not have enough data? Have we not collected the right type of data to definitively resolve the question? Why do we not have enough data or the right type of data?
- Can you explain what your plan is for solving this issue and getting us closer to answering the question you've outlined?
 - E.g. this is the part where you get to be creative. Be as practical or impractical as you want. If you think you have a real solution, go for it. If you can figure out how to do it assuming technology that doesn't yet exist or that you could pull off with unrealistic funding levels thats good too.

If you answer yes to all of those questions, then you are ready to go!

Timeline:

10/5 Finalize Groups

11/2 Select topic: DEADLINE

Each group should email me to let me know what your topic is. Email should contain: 3-4 sentences that include a statement about the issue in biodiversity that you think needs to be studied, why you think its important to study, and the gap in knowledge that you think needs to be filled.

11/2 Start thinking about how you will address your question (How will you fill the gap in knowledge you identified)

11/8 Do you have a plan of how you would fill the gap in knowledge? YAY! You're ready to put your talk together! No? You have another class period to work on this.

11/21 Group Presentations Begin

Course Grading Scale

Percent	Grade
90.0 - 100.0	A

87.0 - 89.9	A-
84.0 - 86.9	B+
81.0 - 83.9	B
78.0 - 80.9	B-
75.0 - 79.9	C+
72.0 - 74.9	C
69.0 - 71.9	C-
66.0 - 68.9	D+
63.0 - 65.9	D
60.0 - 62.9	D-
0 - 59.9	E

UF POLICIES

University Policy on Accommodating Students with Disabilities

The goal of the course is to create an environment where all students have an equivalent learning environment. If you need accommodations so that your opportunity to learn the material is equivalent to others, please do not hesitate to let me know. Students requesting accommodation for disabilities must first register with the Dean of Students Office (<http://www.dso.ufl.edu/drc/>). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

University Policy on Academic Misconduct

Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at <http://www.dso.ufl.edu/students.php>.

Netiquette and Communication Courtesy

All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. All in-person and electronic communications related to this course are covered by the course's code of conduct statement.

CAMPUS RESOURCES:

Health and Wellness:

U Matter, We Care: U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit umatter.ufl.edu/ to refer or report a concern and a team member will reach out to the student in distress

Counseling and Wellness Center: Visit counseling.ufl.edu/ or call 352-392-1575 for information on crisis services as well as non-crisis services.

Sexual Assault Recovery Services (SARS) Call 352-392-1161 for 24/7 information to help you find the care you need, or visit shcc.ufl.edu/.

University Police Department Visit police.ufl.edu/ or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; ufhealth.org/emergency-room-trauma-center

Academic Resources:

E-learning technical support, Contact the UF Computing Help Desk at 352-392-4357 or via e-mail athelpdesk@ufl.edu.

Career Connections Center, Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services career.ufl.edu/

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

Writing Studio, 2215 Turlington Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

Student Complaints On-Campus: sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.

CLASS SCHEDULE

Weeks 1-3: Thinking about what biodiversity means/is

1. August 23 Introductions. What does the word biodiversity mean to you?
2. August 28 Taxonomic Alpha, Beta, Gamma Diversity - Concepts
 - Reading: [Disentangling the Drivers of Beta Diversity Along Latitudinal and Elevational Gradients](#)
 - [Questions](#)
3. August 30 Taxonomic Alpha, Beta, Gamma Diversity - Practice
 - Class Activity: Exploring taxonomic diversity. Bring computers.
4. September 4 Phylogenetic and functional diversity - Concepts
 - Reading: [Functional diversity \(FD\), species richness and community composition](#)
 - [Questions](#)
5. September 6 Phylogenetic and functional diversity - Practice
 - Class Activity: Exploring phylogenetic and functional diversity. Bring computers.

Weeks 4-7: Local-scale Biodiversity Patterns & Processes

6. September 11 Assembly Mechanisms - Niches and Biotic and Environmental Filters
 - Reading: [Rethinking Community Assembly through the Lens of Coexistence Theory](#)
 - [Questions](#)
7. September 13 Assembly Mechanisms - The role of Stochasticity and History
 - Reading: [Drought mediates the importance of stochastic community assembly](#)
 - [Questions](#)
 - Class Activity: Create your elevator pitch
8. September 18 Patterns in Taxonomic, Phylogenetic, and Functional Diversity
 - Reading: [Phylogenetic Overdispersion in Floridian Oak Communities](#)
 - Reading: [Spatial mismatch and congruence between taxonomic, phylogenetic and functional diversity](#)
 - [Questions](#)

9. September 20 Biodiversity through time

Debate-style discussion: There will be two groups and the papers you read for this class differ depending on what group you were assigned to. Everyone needs to read: [Assemblage Time Series Reveal Biodiversity Change but Not Systematic Loss](#)

- **** Group 1 ****
 - Reading: [Species-level and community-level responses to disturbance: a cross-community analysis](#)
 - Reading: [Recent Trends in Local-Scale Marine Biodiversity Reflect Community Structure and Human Impacts](#)
- **** Group 2 ****
 - Reading: [Estimating local biodiversity change: a critique of papers claiming no net loss of local diversity](#)
 - Reading: [Biodiversity change is uncoupled from species richness trends: consequences for conservation and monitoring](#)

- Group Projects: Sharing Interests

10. September 25 Species Networks

- Readings: [Stability of Ecological Communities and the Architecture of Mutualistic and Trophic Networks](#)
- [Questions](#)

11. September 27 Biodiversity Ecosystem Function

- Readings: [Effects of biodiversity on the functioning of trophic groups and ecosystems](#)
- Readings: [Emerging horizons in biodiversity and ecosystem functioning research](#)
- Readings: [Plant Species Richness and Ecosystem Multifunctionality in Global Drylands](#)
- [Questions](#)

12. October 2 Patterns of Abundance

- Readings: EXCERPTS from Niche Apportionment and Species Coexistence Chapter will be emailed to group.
- Readings: [Hyperdominance in the Amazonian Tree Flora](#)
- [Questions](#)

Weeks 7-10 Regional-Scale Diversity Patterns & Processes

13. October 4 Regional Assembly - Dispersal

- Reading: [The metacommunity concept: a framework for multi-scale community ecology](#)
- [Questions](#)
- Group Project Day. Start talking with each other about big challenges or important unanswered question that you all are interested in.

14. October 9 Regional Assembly - Environmental Heterogeneity

- Reading: The “Frankenpaper” - emailed to the class listserv
- [Questions](#)
- Class Activity: Group Projects

15. October 11 Habitat Fragmentation patterns

- Reading: [How fragmentation and corridors affect wind dynamics and seed dispersal in open habitats](#)
- Reading: [Habitat fragmentation and genetic variability of tetrapod populations](#)
- [Questions](#)
- Class Activity: Group Projects

16. *October 16 Local-Regional Diversity Relationships*

- Reading: [Community diversity: relative roles of local and regional processes](#)
- Reading: [The Combined Influence of the Local Environment and Regional Enrichment on Bird Species Richness.](#)
- [Questions](#)

17. *October 18 Species-Area Relationships*

- Reading: species-area relationship frankenpaper (emailed to group)
- Reading: [Analysis of an evolutionary species–area relationship](#)
- [Questions](#)
- Class Activity: Group Projects

18. *October 23 Core-Transient Framework*

- Reading: [Explaining the excess of rare species in natural species abundance distributions](#)
- Reading: [Opposing mechanisms drive richness patterns of core and transient bird species](#)
- [Questions](#)

19. *October 25 Group Project Day*

Weeks 11-13 Global Biodiversity Patterns and Processes

21. *October 30: Biogeographic Processes: Biogeographic Regions*

- Readings: [An update on Wallace’s zoogeographic regions of the World](#)
- [Questions](#)

22. *November 1: Biogeographic Processes: Evolution*

Readings: [Biogeographic regions and events of isolation and diversification of the endemic biota of the tropical Andes](#)

- [Questions](#)

23. *November 6 Hotspots and Endemism*

- Readings: [Global hotspots of species richness are not congruent with endemism or threat](#)
- Readings: [The Influence of Late Quaternary Climate-Change Velocity on Species Endemism](#)
- [Questions](#)

24. *November 8 Latitudinal Gradient:*

Read the paper you were assigned in class - read the abstracts of the other 3. For this assignment, be able to explain the processes generating the latitudinal gradient of diversity that your assigned

paper examined. You will break into small groups first to make sure everyone understands their mechanisms, and then each group will explain their mechanisms to the rest of the group.

- Readings: [Faster Speciation and Reduced Extinction in the Tropics Contribute to the Mammalian Latitudinal Diversity Gradient](#)
- Readings: [Plant diversity increases with the strength of negative density dependence at the global scale](#)
- Readings: [Global Biodiversity, Biochemical Kinetics, and the Energetic Equivalence Rule](#)
- Readings: [A latitudinal gradient in planktonic marine bacteria](#)
- Group Projects

25. November 13 Large-scale Patterns of Phylogenetic, Functional, and Species Diversity

- Reading: [Understanding global patterns of mammalian functional and phylogenetic diversity](#)
- [Questions](#)

26. November 15 Extinctions

- Reading: [Pleistocene megafaunal collapse, novel plant communities, and enhanced fire regimes in North America](#)
- Reading—you only need to read the abstract! [Extinctions and the loss of ecological function in island bird communities](#)
- [Questions](#)
- Group Project time

Weeks 14-15: Group Presentations and Wrap-Up

27. November 20

- No readings: Group Projects

28. November 27

- No readings Group Projects

29. November 29 Group Presentations!

30. December 4: What have we learned? Wrapping up the Semester

- Readings: Look over the questions and topics on the schedule and reflect on what we have covered over the past semester
 - What themes or processes came up multiple times this semester?
 - What role does spatial scale play in our understanding of biodiversity?
 - When you entered the class, what dimension of biodiversity did you focus on? How did you assume it was related to other aspects of biodiversity? Did the class strengthen or change the way you think about that?