Topics in Evolutionary Ecology: Extreme Life Styles

Instructor: Liana Burghardt

Class Time: 3:05pm-5:35pm Monday in BioSci 063

Office hours: Wed. 9:45am-11:45am BioSci 235 (check BioSci 248 as well)

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Course Description: Most of us are quite familiar with the life span and reproductive patterns of mammals like us, but many are less familiar with the myriad other ways that organisms have found to thrive. In this class, we will explore the ecological factors that shape the evolution of the diversity of life we see in the natural world from social insects, extreme sexual dimorphism, and environment dependent sexual expression to the plants that seem to defy aging and live forever, bacteria and insects impervious to radiation, and parasites that control their hosts. Through examining the processes that shape these life histories we will learn about classic topics in evolutionary ecology including natural selection, sexual selection, sociality, phenotypic plasticity, mutualisms, the evolution of senescence, and classic life history theory. Historically, science advances when people ask questions using organisms that are best suited to answering their question. Now that advanced genetic tools can be used in non-model systems, it is again vital that students know, appreciate, and understand the diversity of ways that organisms thrive and the processes that lead to that diversity. Therefore, we will also spend time discussing how humans have leveraged these diverse life cycles to solve uniquely human problems. A substantial portion of this class will be based on reading and discussing primary literature. Students will also be guided through the development of a major synthesis article and presentation over the course of the class.

Objectives: By the end of the class you should be able to…

- Describe how evolutionary processes shape ecology and how ecological process shape evolution.
- Critically evaluate the validity of theoretical and experimental conclusions in the primary literature
- Synthesize current knowledge about a particular extreme life style, propose new, interesting questions that can be addressed in the future, and clearly and concisely present this information in written, visual, and oral formats
- Make connections across organisms to understand how research in diverse organisms can help us understand human life span, disease, conservation etc…

Student Expectations

This will be an upper level seminar based on reading primary literature and with an emphasis on synthesis. It does not require any prior background with ecology. For each class students will be asked to read on average one to two chapters giving background information on the topic at hand and two current articles. You are expected to attend class unless you have a prearranged excuse. Throughout the term, students will be expected to participate in discussions and be prepared to summarize key points in the readings. The class will be devoted to critically interpreting and discussing the reading as well as exploring how to communicate science effectively in writing, visually, and orally. There is not an expectation that you fully understand the material before class, but careful reading and preparation is critical to gaining the most from the limited class time that we have. Over the course of the class, students will also research and

write three short articles synthesizing how evolution and ecology has shaped an organism of their choice. As the final project, students will write a more in-depth synthesis centering on how multiple processes combine to shape organisms. Students will get feedback both from the instructor and other students during the development of these products. At the end, students will give short presentations on these projects to the whole class.

Grading

- Synthesis article and presentation (40% total): Paper proposal: 2.5%, annotated bibliography: 2.5%, first draft: 2.5%, second draft: 2.5%, Final paper: 20%, Final presentation: 10%
- 2 Synthesis assignments (24% total- 8% for first and 16% for second)
- 4 written critiques of other's work (10% total)
- In class assignments during skills workshops (15% total)
- Class participation as measured by attendance and quizzes on readings (11% total)

All assignments will be turned in via the Assignments tab in Sakai by the day and time noted on the current syllabus on Sakai. Time stamps in Sakai will be used to ascertain whether assignments were turned in on time or whether they fall under the late work policy. Please check that you get an assignment notification upon submission to ensure it was submitted properly. Submit all assignments in a recent Word format to facilitate providing feedback.

Your final grade for the course will be determined on a 10 point grading scale:

Highest	Lowest	Letter
100.00 %	93.00 %	A
92.99 %	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 %	60.00 %	D
59.99 %	0.00 %	F

Late work

Late work without penalty will only be accepted if permission from the instructor is given ahead of time. If permission is not given, your final grade on that assignment will be reduced by 10% for each day it is late. Days late are always rounded up (*e.g.* 5 minutes late is rounded up to one day late). For those assignments that are going to the critiqued by others, it is particularly essential that assignments are turned in on time because you will be inconveniencing your partner if you do not.

Missing Class

You will be able to make up your participation grade for missing two classes in the semester that are not school sanctioned by writing a summary and reflection on the readings you missed. This will be due in the "Make Up Summaries" in the Assignments tab in Sakai.

Summaries are due by the beginning of class time week after the missed class. Unlimited school sanctioned absences will be able to be made up for in this way, but I must be provided official documentation.

Open Class Room Policy

This class is predicated open discussion between participants and is welcoming to all viewpoints that are presented in a thoughtful and respectful way. As the instructor, I will do all that I can to foster a safe environment for discussion. By being in this class each student also agrees to be responsible for their own conduct. If you are not comfortable with something that occurs in relation to this class, please do not hesitate to bring in up. If you would prefer anonymity in broaching a topic you may also place an anonymous letter in my mailbox in BioSci building.

- Duke's non-discrimination policy: https://law.duke.edu/admis/nondiscrimination/
- Counseling and Pyschological Services (CAPS): https://studentaffairs.duke.edu/caps

Community Standards:

You will be expected to abide by the Duke Community Standard especially as regards to plagiarism. The novelty of your work will be checked with plagiarism software as part of the grading process, so it would behoove you to check it yourself beforehand. There are numerous free versions available.

Tentative schedule—This may change over the course of the semester. Up-to-date materials and due dates can always be found on Sakai.

Class #	Topic	Readings	Assignments
1- Jan 7th	Introduction Case Study- Mouse coat color Skills workshop- Finding resources/making biblio	none	
2- Jan 12th	Adaptation to the Environment Skills workshop- Writing synthesis assignments	See Sakai	Synthesis 1 draft Due Sat Jan 24th at noon
3- Jan 26th	Predator/Prey Interactions Skills workshop- How to critique other's work – instructions and in class example	See Sakai	Turn in written critique Wed Jan 28th at noon Final draft Synthesis 1 due Sat Jan 31st at noon
4- Feb 2nd	Mutualism/Parasitism Skills workshop- Concept mapping intro	See Sakai	
5- Feb 9th	Phenotypic Plasticity Skills workshop- Conceptual figure intro	See Sakai	Synthesis 2 annotated biblography +concept map due Wed Feb 11th at 11:55pm
6- Feb 16th	Niche Construction Skills workshop- In class feedback on concept maps and Exercise on creating conceptual figures	See Sakai	Synthesis 2 draft (writing + concept figure) due Wed Feb 18th at 11:55pm Peer reviews (2) due Sat Feb. 21st at 11:55pm
7- Feb 23rd	Experimental Co-evolution In class feedback on conceptual figures- cont.	See Sakai	Synthesis 2 final (writing + concept figure) due Sat Feb 28th at 11:55pm
8- Mar 2nd	Sexual Selection Skills workshop- Intro to final paper assignment and how to pick a good organism	See Sakai	Two paper topic proposals due before Wed March 11th at 11:55 pm
9- Mar 16th	Evolution of Sex (Guest discussion leader!) Skills workshop- Storyboarding Presentations	See Sakai	rough outline/biblio/concept map (U pick 2) due Friday March 20th at 11:55 pm
10- Mar 23rd	Evolution of Sociality and Kin Selection Skills workshop- Creating presentations in powerpoint + In-class peer feedback	See Sakai	1st draft of final paper due Wed March 25th at 11:55pm. Peer reviews (1) due Sat March 28th at 11:55pm.
11- Mar 30th	Age and Size at Reproduction Skills workshop- Presentation practice in groups	See Sakai	2nd draft of final paper due Wed- Apr 1st at 11:55pm. feedback from Liana
12- Apr 6th	Senescence- How long should you live? Or why should you die? Final Presentations (8)	See Sakai	½ class has final presentations due Apr 6th in class
13- Apr 13th	Final Presentations (8) + Course Evaluations	See Sakai	½ class has final presentations due Apr 13th in class
14- Apr 20th	Speciation: Case Study in Cichlids + Course Wrap up and Feedback	See Sakai	Final Papers Due Wed April 22nd at noon