

**Syllabus, BISC 583, Spring 2020**  
**Evolution & Adaptation of Marine Organisms**  
*Draft version, 12/20/19*

Course overview

BISC 583 is a 4-unit course covering fundamentals of evolutionary patterns and processes in the marine environment, with emphasis on rates of adaptation to a changing ocean. It is primarily intended for first-year students in the Marine Biology and Biological Oceanography (MBBO) Graduate Program. Prerequisites are admission to the MBBO program or permission from the instructors.

Course objectives

This is a core course for first year students in the MBBO program. Students will gain background in the essentials of evolution and adaptation in marine microbes and metazoans, including quantitative approaches. In addition, they will gain experience in critiquing the current literature through discussions and written presentations.

Faculty

Suzanne Edmands, [sedmands@usc.edu](mailto:sedmands@usc.edu), AHF 130, 213-740-5548  
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Format

The course will meet in AHF 259 from 11am - 12:20 pm on Mondays and Fridays, with class meetings generally alternating between faculty lectures and student-led discussions of primary literature. Course content will be posted on Blackboard (<https://blackboard.usc.edu/>).

Textbooks

Campbell Biology 11<sup>th</sup> ed., 2016 (the 10<sup>th</sup> edition is also acceptable). If you do not already have a copy of this textbook please let your instructors know – we may be able to locate a copy for you to borrow.

Grading

Letter grades will be based on three midterms (20% each), one final (10%), student-led discussions (15%) and written assignments (15%).

*Student-led discussions:* Students will alternate leading discussions of journal papers throughout the semester. All students should come to class prepared to lead, and the leader will be chosen in class. For each article students should be prepared to (1) state the central question or hypothesis of the article, (2) explain the tables and figures, (3) explain the main conclusion(s), (4) review key evidence supporting the conclusion(s), and (5) provide specific questions for general group discussion.

*Writing assignments:* Each of the three instructors will make assignments worth 5%. This may include manuscript reviews, essays, data analyses and/or problem sets.

*Midterms:* Each of the three midterms will include a combination of short answer questions, calculations and essay questions.

*Final exam:* The final exam will be essay format.

### Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the instructor(s) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

### Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:

<http://www.usc.edu/dept/publications/SCAMPUS/gov/>. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.

### Schedule

Date	Topic	Instructor	Reading	Assignments
<i>Evolutionary Processes</i>				
M Jan 13	Intro to evolution and adaptation	Edmands	Campbell ch. 22	
F Jan 17	Journal club	Edmands	Gould & Lewontin 1979; Kingston et al. 2019	
M Jan 20	MLK Day (no class)			
F Jan 24	Mutation, genetic drift and gene flow	Edmands	Campbell ch. 23	
M Jan 27	Journal club	Edmands	Cleves et al. 2018; Graham & Barreto 2019	Assignment 1 due
F Jan 31	Quantitative genetics	Edmands	Hill 2010. Understanding and using quantitative genetic variation	
M Feb 3	Journal club	Edmands	van Wijk et al. 2013, Babonis et al. 2018	
F Feb 7	Species and speciation	Edmands	Campbell ch. 24	
M Feb 10	Journal club	Edmands	Meyer et al. 2016, Little et al. 2019	Assignment 2 due
F Feb 14	<b>Midterm I</b>	Edmands		
<i>Evolutionary Patterns</i>				
M Feb 17	Origin of Life? (President's Day - no class)	Heidelberg		
F Feb 21	Journal club	Heidelberg		
M Feb 24	Tree of Life	Heidelberg		
F Feb 28	Journal club	Heidelberg		
M Mar 2	Bacteria/Archaea	Heidelberg		
F Mar 6	Journal club	Heidelberg		
M Mar 9	Eukaryotes/Multicellularity	Gracey		
F Mar 13	Journal club	Gracey		

USC Spring Break March 15-22				
M Mar 23	Evo/Devo	Gracey		
F Mar 27	<b>Midterm 2</b>	Gracey/ Heidelberg		
<i>Selective Agents</i>				
M Mar 30	Water & Nutrients	Gracey		
F Apr 3	Journal club	Gracey		
M Apr 6	Temperature & Pressure	Heidelberg		
F Apr 10	Journal club	Heidelberg		
M Apr 13	Temperature stress	Gracey		
F Apr 17	Journal club	Gracey		
M Apr 20	Water & Nutrients	Heidelberg		
F Apr 24	Journal club	Heidelberg		
M Apr 27	Hypoxia	Gracey		
F May 1	<b>Midterm 3</b>	Gracey/ Heidelberg		
W May 6	<b>Final Exam, 11am</b>			

### Journal club papers

Babonis LS, MB DeBiase, WR Francis, LM Christianson, AG Moss, SHD Haddock, MQ Martindale & JF Ryan. 2018. Integrating embryonic development and evolutionary history to characterize tentacle-specific cell types in a ctenophore. *Mol. Biol. Evol.* 35(12): 2940-2956.

Cleves PA, ME Strader, LK Bay, JR Pringle & MV Matz. 2018. CRISPR/Cas9-mediated genome editing in a reef-building coral. *Proc Natl Acad Sci USA.* 115(20): 5235-5240.

Erickson, PA, J Baek, JC Hart, PA Cleves & CT Miller. 2018. Genetic dissection of a supergene implicates *Tfap2a* in craniofacial evolution of threespine sticklebacks. *Genetics* 209: 591-605.

Gould SJ & RC Lewontin 1979. The spandrels of San Marco and the Panglossian paradigm: a critique of the adaptationist programme. *Proc. R. Soc. Lond. B* 205:581-598.

Graham AM & FS Barreto. 2019. Novel microRNAs are associated with population divergence in transcriptional response to thermal stress in an intertidal copepod. *Molec. Ecol.* 28(3): 584-599.

Kingston ACN, RL Lucia, LT Havens, TW Cronin & DI Speiser. 2019. Vision in the snapping shrimp *Alpheus heterochaelis*. *J. Exp. Bio.* 222: jeb2019015

Hill WG. 2010. Understanding and using quantitative genetic variation. *Phil. Trans. R. Soc. B* 365: 73-85.

Little AG DN Fisher, TW Schoener & JN Pruitt. 2019. Population differences in aggression are shaped by tropical cyclone-induced selection. *Nature Ecol. Evol.* 3(9): 1294-1297.

Meyer JR, DT Dobias, SJ Medina, L Servilio, A Gupta, RE Lenski. 2016. Ecological speciation of bacteriophage lambda in allopatry and sympatry. *Science*: DOI: 10.1126/science.aai8446

van Wijk, SJ, MI Taylor, S Creer, C Dreyer, FM Rodrigues, IW Ramnarine, C van Oosterhout & GR Carvalho. 2013. Experimental harvesting of fish populations drives genetically based shifts in body size and maturation. *Front. Ecol. Environ.* 11(4): 181-187.