

SYLLABUS
BIOL 301: Marine Ecology and Evolution
Spring 2007
<http://www.biology.hawaii.edu/301>

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Office hours: Tues 12:00-1:00 and by appointment
Class meeting time: Tues & Thurs: 10:30-11:45, St. John 011

Visit the Biol 301 Website at <http://www.biology.hawaii.edu/301> for all course content and information

This course surveys the dominant ecological and evolutionary processes in the sea. We will examine the special interrelationships between marine organisms and their environment: from shorelines, out to the open sea, and down to the deep sea floor. The course includes sections on tropical marine ecosystems including coral reefs and benthic sea grass communities, deep sea communities and hydrothermal vents, and polar seas. The function, ecology, and evolution of marine organisms inform understanding of how human activities affect marine populations, communities, and ecosystems. During the second half of this course we will explore over fishing, marine invasion biology, marine pollution, as well as current efforts to conserve marine biodiversity.

Technology is pushing the frontiers of what is known and unknown in the marine sciences. Scientific approaches to questions in marine biology range from the molecular and nanoscale, to the global, such as using remote sensing to understand patterns of primary production across ocean basins. Biol 301 integrates examples of how new technology is used to solve basic and environmental problems in marine biology.

Additional expertise and breadth will be provided by a number of guest lectures. Guest lectures will give you exposure to experts in other fields of marine biology, drawing from other Departments and Labs within the University of Hawaii.

BIOL 301/L is not a survey of marine biodiversity. Other required courses and electives will give you excellent and detailed surveys of diversity within specific groups. For example: marine algae (BOT 480: Algal Diversity & Evolution), invertebrate animals (ZOOL 475/L: Biology of Invertebrates), and marine bacteria (MICR 401/L: Marine Microbiology). As you focus within the major, you can take specific courses on organisms as small as viruses and as large as marine reptiles and mammals. The complete curriculum can be found at: http://www.hawaii.edu/marine_biology/courses.htm

Goals

1. To understand how organisms function in marine environments. What are the special challenges to reproduction, development, physiology, movement and navigation, etc. imposed by the physical and biological environments of the sea? How have marine organisms adapted to meet these challenges?
2. What are the major ecological processes that regulate abundance and biodiversity of marine species? Why do marine populations fluctuate over time and space? What controls regional and global patterns of biodiversity in the sea?
3. To integrate knowledge of function, ecology, and evolution of marine organisms to understand and predict potential responses to environmental change. How will environmental change effect marine populations, communities and ecosystems?

Text, Reader, and Lab Manual

- Text- *Marine Biology: An Ecological Approach*, 6th Edition, James Nybakken and Mark Bertness, Pearson Benjamin Cummings
- Biol 301 Reader- A bound collection of book chapters and articles, primary, and secondary literature. EMA Campus Copy Center in the student center next to Taco Bell. Phone: 941-1098
- Biol 301L Lab Manual- Available at the EMA Campus Copy Center.

Prerequisites

- BIOL 171 & 171L Introduction to Biology I & Lab, 3/1 credits
- BIOL 172 & 172L Introduction to Biology II & Lab, 3/1 credits
- BIOL 265 & 265L Ecology & Evolution Biology & Lab, 3/1 credits
- BIOL 275 & 275L Cell & Molecular Biology & Lab, 3/1 credits (can be taken concurrently with my course).

In addition to these biology courses, I expect that you have taken:

- Chemistry, 1 year
- Physics, 1 year
- Calculus, 1 Semester

Support a Positive Learning Environment

Please turn your cell phone off and away during class. Extraneous talking or activities that interfere with other student's opportunity will not be tolerated. No eating or drinking in the lecture room. Lectures are scheduled for 1 hour and 15 minutes and your full attention is required during this period. Questions about what is proper academic conduct at the University of Hawaii is fully described at: <http://www.hawaii.edu/student/conduct/>

Issues of cheating, plagiarism, or poor student conduct will be handled in a swift and fair manner by me and the Dean of Students.

Grades

Three midterms, 20% each (= 60% total). The final exam (= 40% total) is a double length test with 50% covering material since Exam 3 and 50% covering material from the entire course.

In assigning grades, we will use whichever of the following two methods, absolute vs. relative scoring, that gives the highest grade for each individual student:

A range:	> 88% of total points	-or-	> 85 percentile
B range:	> 78% of total points	-or-	> 65 percentile
C range:	> 65% of total points	-or-	> 30 percentile
D range:	> 55% of total points	-or-	> 10 percentile

Exam Format/Polices

Exams will include a series of short answer and essay questions designed to test your knowledge of material presented in lectures and on in-class reading. You will often be asked to use lecture and reading material to solve original problems. Exams typically include a list of terms to define. Exams must be taken during the class period on the days listed in the syllabus. Please bring a calculator and at least two sharpened pencils to class when exams are given.

Schedule of Lectures and Reading*

Date	Day	Topic	Reading*
1/9	T	Course introduction: History of marine biology	
1/11	R	The sticky and turbulent life in moving fluids	Reader: Vogel 1981; Denny 1988
1/16	T	No Lecture: Tuesday Cruise	
1/18	R	No Lecture: Thursday Cruise	
1/23	T	Factors that control primary production	N&B Ch. 2: 43-77; Reader: Field et al. 1998
1/25	R	The classic model of ocean ecosystems: of phytoplankton and copepods	N&B Ch. 2: 77-100
1/30	T	New model of ocean ecosystems: food webs at the nanoscale	Reader: Fenchel 2001
2/1	R	The causes of global warming and the consequences on marine environments	Reader: Broecker and Denton, 1990; Alley, 2004
2/6	T	EXAM I	
2/8	R	Marine life histories I: evolution and analyses of marine life histories	Handout; Levinton Ch. 5: 101-117
2/13	T	Marine life histories II: sex and sex allocation	Handout; Levinton Ch. 5: 101-117
2/15	R	Marine life histories III: fertilization success in the sea	Reader: Yund 2000
2/20	T	Life histories of marine organisms IV: larval development and dispersal	Handout; Levinton Ch. 5: 117-132
2/22	R	The fluctuating world of marine populations I: sources of recruitment variation	Reader: Underwood and Keough 2001
2/27	T	Global trends in biodiversity- patterns and hypotheses	Reader: Roy et al. 1998
3/1	R	Origins of biodiversity I- genetic structure	Handout
3/6	T	EXAM II	
3/8	R	Origins of biodiversity II- species and speciation	Reader: Palumbi 1992
3/13	T	Coral reefs I: history and geology	N&B Ch. 9: 407-428
3/15	R	Coral reefs II: ecological interactions	N&B Ch. 9: 428-453
3/20	T	Functional ecology of tropical marine algae	Handout
3/22	R	Soft bottom communities	N&B Ch 5: 196-214
3/27	T	SPRING BREAK	
3/29	R	SPRING BREAK	
4/3	T	Sea grass and mangrove communities	N&B Ch. 5: 233-240; Ch. 9:453-467
4/5	R	EXAM III	
4/10	T	Polar Seas I: marine biology at the extreme	N&B Ch. 5: 243-260; Reader: Dayton et al. 1969
4/12	R	Polar Seas II: adaptations to cold and dark environments	Reader: Marsh et al. 2001
4/17	T	Deep seas and hydrothermal vents	N&B Ch. 4: 144-166; Reader: Distel 1998; Distel 2000
4/19	R	Shifting baselines and the impacts of fishing	N&B Ch. 11: 500-516; Reader: Pauly et al. 1998; Jackson 2001
4/24	T	New developments in marine pollution: paper or plastic?	N&B Ch. 11: 520-530; Reader: Moore 2003
4/26	R	Comparative developmental biology	Handout
5/1	T	Marine invasion biology and marine protected areas	N&B Ch. 11: 531-532; Reader: Cohen and Carlton 1998, Palumbi 2001
5/10	R	Final Exam, 9:45-11:45	

* I may make changes to the lecture schedule and/or readings to fit the needs of the course.

Additional References and Reading

Following are some resources for you if you would like more information on a particular topic. Most should be available in the library here.

General/Marine Ecology:

- Bertness, M. D., Gaines, S. D. and M. E. Hay. 2001. Marine community ecology. Sinauer Associates, Inc. Sunderland, MA.
- Krebs, Charles J. 1985. Ecology: the experimental analysis of distribution and abundance. Harper and Row, 2nd Edition. New York
- Nybakken, J. W. and M. D. Bertness. 2004. Marine biology: an ecological approach. 5th Edition. Pearson/Benjamin Cummings. New York
- Valiela, Ivan. 1995. Marine ecological processes. 2nd Edition. Springer, New York

Biological Oceanography:

- Miller, Charles. Biological Oceanography. Blackwell publishing, Malden, MA

Evolution:

- Futuyma, D. J. 1998. Evolutionary biology. Sinauer Associates, Sunderland, MA
- Tree of Life Web Project: <http://www.tolweb.org/tree/>
- University of California, Berkeley Museum of Paleontology, Discover the History of life: <http://www.ucmp.berkeley.edu/exhibit/phylogeny.html>

History of Marine Biology:

- NOAA Ocean Explorer: <http://oceanexplorer.noaa.gov/history/history.html>

Biological Oceanography of the Hawaiian Islands:

- SOEST Ocean Atlas of Hawaii: <http://radlab.soest.hawaii.edu/atlas/>