

Instructor: Karina Nielsen

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Lecture: Tuesday & Thursday, 1– 2:15pm, 30 Darwin

Field & Laboratory: Tuesdays 2:25 – 5:15, Sonoma & Mendocino coast & 231 Darwin

Office Hours: Thursdays 2:30-4:00pm OR by appointment

Prerequisites: Biology 121 & 122, and Math 165 (or equivalent; no exceptions)

Course Description:

This course provides an overview of current topics in marine ecology and conservation with an emphasis on temperate coastal ecosystems. The field & laboratory sessions provide an opportunity for students to have hands-on experience with field and laboratory research projects and learn the basics of experimental design, data analysis, and data presentation. At the end of the course students should be able to:

- 1) Understand & describe natural and anthropogenic factors that influence marine communities and ecosystems.
- 2) Recall specific examples of studies and the evidence used in those studies that have contributed to the scientific understanding of these factors.
- 3) Understand and appropriately use ecological vocabulary
- 4) Describe how to test ecological hypotheses
- 5) Understand the basics of experimental design and sampling in the field & lab
- 6) Interpret the results of experimental data
- 7) Search the scientific literature on a specific topic using computer databases
- 8) Synthesize evidence and information from the peer-reviewed scientific literature to summarize what is known about a topic or answer a specific question

Required:

1. All field trips are required and will include a weekend field trip (4/12-4/13) and a Saturday boat trip to sample zooplankton on the Bodega Marine Lab research vessel.

Costs for lodging on the weekend field trip: \$30.00 paid to the instructor no later than Tuesday, February 5th; we will also plan group meals and share expenses (to be arranged prior to the trip).

a. Ft. Bragg Weekend Field Sampling Trip: April 12 & 13; lodging (4/12) at the Jughandle Creek Farm & Nature Center. We will have group meals for dinner (4/12), breakfast (4/13) & lunch (4/13); Students must pack a bag lunch for the first day (4/12) as we'll go straight to the field from campus. Depart SSU 4/12 @ 7 am; return SSU 4/13 ~ 6 pm. Meet by Enterprise rental van parking lot next to Schulz; Transportation: University rental vans.

b. R/V Mussel Point Oceanographic Sampling: Dates TBD (considering 3/1; 3/8; 4/5; 4/19)
Transportation: car pool or on your own. Depart from Bodega Harbor at 8 am or 11 am)

c. Pinnacle Gulch & Bodega Head Field Sampling Trips Tuesdays February 5th, 19th & March 5th ; Depart SSU 1 pm, return by 6 pm. Meet by Enterprise rental van parking lot next to Schulz; Transportation: University rental vans.

3. Access to WebCT to download course materials

4. Media for saving data files (e.g., floppy disk, flash drive)

5. Field Clothing. **Important:** cotton clothing is strongly discouraged (e.g., blue jeans, sweat pants/jackets); please choose: polyester, fleece, wool, nylon or other quick drying synthetic fabrics). This is to prevent discomfort and *hypothermia* while doing field work while doing field surveys for several hours outside under potentially adverse weather conditions.

Required field gear:

- a. Rubber boots (knee-high)
- b. Rain coat (rain pants *recommended*)
- c. Wool or polyester fleece sweater
- d. Water bottle

Grading: Final grades will be based on assessment of the assignments listed below. Final letter-grades will be assigned as follows: A = 94-100%; A- = 90-93%; B+ = 88-89% B = 84-87%; B- = 80-83%; C+ = 78-79% C = 74-77%; C- = 70-73% D = 60-69%; and F = 59% or below.

Percent of Final Grade	Assessments of Student Learning
40	Essay Exams (4; 10 points each)
20	Quick-Writes (most days; 1 point each)
10	Oral Presentation (1; 10 points)
15	Lab Question Sheets (3; 5 points each)
10	Lab Report (1; 10 points)
5	Participation & Attendance

Students are reminded that in order to accomplish the course goals they share responsibility with the instructor for their own learning. The instructor has not yet discovered a way to mind meld with each student and download her knowledge into their heads. But when I do I'll become rich and famous and no longer teaching you for a living...

Expectations for out of class work: From the SSU catalogue: "A minimum of two hours preparation for each hour of regular class work should be expected; in upper-division and graduate-level courses, additional time may be required."

This is an upper division class consisting of 3 hours of lecture and 3 hours of lab per week. I'll let you do the math!

Attendance: Participation in all course activities is expected. This course involves field-based exercises timed to coincide with low tides that will result in some late returns (~ 6 pm) to campus on our Tuesday field trip dates and additional field activities outside of scheduled class times. Because of the extra time you will spend in the field outside of regular class times, I have cancelled some of our later lab sessions to balance out our workload. This class offers you the opportunity to participate in hands-on field research. Field biologists must work when nature dictates, not just when it is convenient. This is part of the learning experience for this field of inquiry. But at least we'll get to go to the beach instead of working in the lab all the time!

Absences: Laboratory make-ups are not possible. Exams can only be made-up for documented circumstances beyond the student's control. Absences from labs, lectures and exams will only be excused for documented circumstances beyond the student's control (e.g., illness, death in the family). If you have a legitimate emergency, please notify me as soon as possible by email or phone.

From the SSU catalogue: "Students should not miss classes except for valid reasons, such as illness, accidents, or participation in officially approved University activities. When students are absent from classes, it is their responsibility to inform the instructor of the reason for absence and to arrange to make up missed assignments and class work. Students should be cautioned that even though absences may be for valid reasons, such absences can impair performance and result in a lower grade."

Academic dishonesty will not be tolerated. **SSU Policy on Cheating and Plagiarism:**

(<http://www.sonoma.edu/uaffairs/policies/cheatingpolicy.htm>)

It is the policy of Sonoma State University to be pro-active in dealing with issues of cheating and plagiarism. Faculty are encouraged to discuss with students academic ethics and the formulation of one's own intellectual material. It is also the policy of Sonoma State University to impose sanctions on students who cheat or plagiarize. Students are expected to be honest in meeting the requirements of the courses in which they are enrolled. Cheating or plagiarism is dishonest, undermines the necessary trust upon which relations between students and faculty are based, and is unacceptable conduct. Students who engage in cheating or plagiarism will be subject to academic sanctions, including a lowered or failing grade in a course; and the possibility of an additional administrative sanction, including probation, suspension, or expulsion. Students suspected or accused of cheating will be dealt with in accordance with Sonoma State University policy.

Disability Accommodations:

If you have a disability that requires accommodation in this class, you must notify the instructor before the third week of class regarding the nature of the accommodation you need. You must register with the SSU campus Disability Resource Center located in Salazar 1049, (Phone: 707-664-2677) (<http://www.sonoma.edu/sas/dss/services.shtml>). The Center will then provide you written documentation of your verified disability and the recommended accommodations, which you must present to the instructor.

Marine Ecology Lecture Schedule

DATE	Topic	Reading Assignments (all PDFs available on Web CT)
29 Jan	Introduction, Logistics, Wave Energy Brainstorming	In Class
31Jan	Introduction to Marine Environment	Nybakken & Bertness ch. 1
05 Feb	Field Trip	
07 Feb	Library Workshop	
12 Feb	Wave Energy Background 1	Koehl 1982
14 Feb	Wave Energy Background 2	Sousa 1979 Paine & Levin 1981
19 Feb	Field Trip	Paine 1979 Stewart & Carpenter 2003
21 Feb	Wave Energy Background 3	Lubchenco & Menge 1978
26 Feb	Wave Energy Student Presentations	See web page
28 Feb	In Class Essay Exam Wave Energy	
04 Mar	Field Trip	
06 Mar	Global Warming Brain Storming Background 1	Barry et al 1995; Sanford 1999
11 Mar	Global Warming Background 2	Doney 2006; Riesbell et al. 2000
13 Mar	Global Warming Background 3	Harley et al. 2006
18Mar	Diversity Lab Question Sheet Due	
20Mar	Global Warming Student Presentations	See web page
25 Mar	Spring Break	
27 Mar	Spring Break	
01 Apr	In Class Essay Exam Global Warming	
03 Apr	No Class	Pauly et al. 2002
08 Apr	Over-Fishing Background 1	Rosenberg et al. 2005
10 Apr	Over-Fishing Background 2	Myers et al. 2007
15 Apr	Over-Fishing Background 3	Alter et al. 2007 & Lenfest RS
17 Apr	Over-Fishing Student Presentations	NOTE CHANGE IN DATE / See web page
22 Apr	No Class	
24 Apr	In Class Essay Exam Over-Fishing	
29 Apr	Marine Protected Areas Background 1	Science of Marine Reserves; Halpern & Warner 2002
01 May	Marine Protected Areas Background 2	Roberts et al. 2001; Mumby et al. 2006
06 May	Marine Protected Areas Background 3	Bergen & Carr 2003; Roberts et al. 2005
08 May	Marine Protected Areas Student Presentations/ Zooplankton Lab Question Sheet Due	See web page
13 May	No Class / Take Home Essay Exam Marine Protected Areas DUE	
15 May	No Class / Feeding Experiment Lab Question Sheet Due	
Finals Week	Sea Star Diet Homework Due	

Marine Ecology Field & Laboratory: Schedule of Activities

DATE	Activity	Topic	NOTES
29-Jan	LAB	Marine Ecology in the News	
5-Feb	FIELD TRIP	Introduction to Field Work & Identifying Common Intertidal Organisms: Pinnacle Gulch	NO LECTURE; Late Return
12-Feb	LAB	Curating Data, Simple Graphics & Statistics Using Excel	Bring Flash Drive & Field Data
19-Feb	FIELD TRIP	Bodega Head (BML) & Pinnacle Gulch: Abundance and Distribution of Mussels	NO LECTURE; Late Return
26-Feb	LAB	Field Data Entry & Analysis	Bring Flash Drive & Field Data
4-Mar	FIELD TRIP	Bodega Head (BML): Species Diversity Protected & Exposed	NO LECTURE; Late Return
SUNDAY 9-Mar	BOAT TRIP	Bodega Harbor: Oceanographic & Zooplankton Sampling Methods	8 OR 11 am
11-Mar	LAB	Field Data Entry & Analysis	Bring Flash Drive & Field Data
18-Mar	NO LAB Scheduled		
25-Mar	<i>SPRING BREAK</i>	<i>SPRING BREAK</i>	<i>SPRING BREAK</i>
1-Apr	LAB	1. Plankton Analysis: Identifying Common Zooplankton 2. Planning Menu & Food Shopping for Weekend Trip	
7-Apr	LAB	Data Entry: Plankton Analysis & Oceanographic Data	Bring Flash Drive
12-13 April	FIELD TRIP	Kibesillah Hill& McKerricher State Park: Sea Star Diet & Size Structure	Weekend Field Trip
15-Apr	LAB	1. Graphical Presentation & Interpretation of Plankton & Oceanographic Data 2. Enter and Analyze Sea Star & Mussel Field Data	Bring Flash Drive
22-Apr	NO CLASS	NO CLASS	NO CLASS
29-Apr	LAB	1. <i>Tegula</i> Feeding Preference and Rate Experiment: Set-up Experiment & Enter Data 2. Finish analysis, graphing & interpretation of Sea Star & Mussel Data	Bring Flash Drive
6-May	LAB	<i>Tegula</i> Feeding Preference and Rate Experiment: Terminate Experiment & Analyze Data	Bring Flash Drive
13-May	NO CLASS	NO CLASS	NO CLASS
20-May	FINALS WEEK	NO CLASS	NO CLASS

Marine Ecology: Guiding Questions Spring 2008

1. Wave energy ‘farms’ are being proposed for the northern coast of California. You have been asked to serve as a consultant for the California Coastal Commission to evaluate the potential environmental impacts of a permanent wave farm installation on intertidal and subtidal communities. What kind of evidence might you look for to answer this question? Summarize the available scientific evidence and come to a conclusion, based on the evidence you find, as to what the potential impacts might be.

Some cool research scientists who have or are working on the impacts of waves on marine organisms and communities:

Mimi Koehl Lab <http://ib.berkeley.edu/labs/koehl/publications.html>

Mark Denny Lab <http://www.stanford.edu/group/denny/index.html>

Brian Gaylord Lab <http://www-bml.ucdavis.edu/facresearch/gaylord.html>

Menge-Lubchenco Lab <http://lucile.science.oregonstate.edu/?q=node>

Google the term “wave energy” to learn more about this technology.

2. Global warming is predicted to have strong impacts on the marine environment. In what ways is the ocean environment predicted to change? What will be the impacts on marine species? Is there any evidence of the impact of global warming on marine life now? What evidence are scientists using to predict what will happen in the future?

Brian Helmuth <http://www.biol.sc.edu/~helmuthlab/>

Jonathon Stillman: <http://online.sfsu.edu/~stillmaj/>

Bill Sydeman: <http://www.faralloninstitute.org/>

Gretchen Hoffman: <http://hofmannlab.msi.ucsb.edu/>

3. Right whales, Atlantic cod, sharks, Pacific rockfish, Pacific salmon, white abalone, native oysters, Toro (bluefin tuna), Chilean sea bass and the sea cow are some of the marine species that are currently overexploited, extinct, on the endangered species list or considered in grave danger of being overfished. Daniel Pauly, a well regarded fisheries biologist has said that we are fishing down marine food webs to such an extent that if business as usual continues he predicts we’ll be left with nothing to eat from the sea aside from jellyfish. Is this prediction justified based on the evidence or is he over-reaching? What scientific evidence exists to explain the decline of so many marine species? Is overfishing by humans the best explanation?

Callum Roberts <http://www.york.ac.uk/depts/eeem/people/roberts/roberts.htm>

Daniel Pauly <http://www.fisheries.ubc.ca/members/dpauly/>

Steve Palumbi: <http://www.stanford.edu/group/Palumbi/>

Ransom Myers *: <http://as01.ucis.dal.ca/ramweb/>

** Sadly Ransom Myers passed away last year and it was a great loss to the field, and of course to his family and friends. His web site is rich with relevant information and is still posted (as is a memorial web site).*

Marine Ecology: Guiding Questions
Spring 2008

4. The California Marine Life Protection Act mandates that California design and implement a network of marine protected areas to protect, restore and preserve species diversity and ecosystem functioning, provide for research, educational and recreational opportunities, and to help restore depleted natural resources of economic value. What, if any, evidence exists that MPAs or a network of MPAs might meet these objectives? How is this process proceeding in California? What is the role of science in the process?

Background resources:

California Department of Fish and Game (CDFG) Marine Life Protection Act (MLPA) Initiative <http://www.dfg.ca.gov/mlpa/>

Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO): Science of Marine Reserves Booklet: <http://www.piscoweb.org/outreach/pubs/reserves>

Some cool research scientists who have or are working on the theory of marine reserves.

Heather Leslie: http://research.brown.edu/myresearch/Heather_Leslie

Loo Botsford:

<http://wfcf.ucdavis.edu/www/Faculty/Loo/BotsfordSiteFiles/BotsfordResearch.html>

Steve Palumbi: <http://www.stanford.edu/group/Palumbi/>