

## Department of Ecology, Evolution, and Environmental Biology (E3B)

### G4125: Marine Conservation Ecology

#### Spring Semester 2008

**Lectures:** Mon 10am -12pm;  
Schermerhorn Extension- Room 1015

#### Instructor: Dr. Kate McFadden

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### Course Outline

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#### **Objective**

#### Course description

This course will open with an overview of the processes which are central to an understanding of marine ecology, including exploring the diverse systems from which the marine environment is composed, from estuaries to the deep sea, and from the tropics to polar regions. The second part of the course examines those human activities that impact upon the marine environment- fisheries, aquaculture, pollution, and global warming- before considering the measures that can be taken to mitigate the adverse effects of man on this complex, fragile environment.

The current E3B curriculum offers a variety of courses that examine terrestrial ecology and conservation biology, however no course teaches students about these topics, processes, systems and impacts in marine ecology. Understanding the importance that marine ecosystems play in conservation biology is crucial training as a conservation biologist or ecologist as most ecological processes are at least partially influenced by marine systems (directly or indirectly through climate or carbon sequestration). This course should be especially useful to Masters students conducting thesis research and PhD students engaged in dissertation research, especially those with interests in marine systems.

#### Organization of the course

**Format:** One weekly 1.5 hour lecture will be used to provide an overview of a topic and provide examples of the application of the theory to ecological analyses. Course lectures intend to present a broad overview of the issues in marine ecology and conservation biology affecting any number of organisms, or marine systems of interest. Each week will cover a major topic in marine ecology and conservation. Examples illustrating the application of

theory to marine ecology and conservation biology will also be presented. If the course enrollment is sufficiently small (i.e. 15 or under), student led discussions of relevant assigned readings will be conducted. Individual students will be assigned to lead these weekly discussions. Each student will be involved in 1 class presentations (30 min in length). Students will lead the class by selecting the week/topic they wish to present, and then by choosing one additional paper for the class to read. On weeks when students are not presenting, or in the case that there are over 15 students enrolled, ecology exercises will be assigned (usually computer simulations or other computer related assignments). Assignments will vary from examining dispersal patterns of invertebrates to examining the population dynamics (using programs such as vortex) of selected marine organisms and the relation of these dynamics to the design of marine reserves. Irrespective of course enrollment at least 5 class exercises will be conducted. Up to 7 exercises will be assigned if course enrollment prohibits the constructive discussion of assigned readings.

### **Readings and Text:**

Students will be expected to do a significant amount of reading for the course and to contribute to discussions on readings. The principal text for this course will be:

Required : Kaiser, M. et al. 2005. Marine Ecology. Oxford University Press.

Recommended: Norse, E. and Crowder, L. 2005. Marine Conservation Biology. Island Press

Also, there will be a significant amount of assigned readings from the literature.

### **Grades will be based on the following:**

Marine Reserve Design Project: 30%

Assigned Presentations & Class Exercises- 25%

Participation- 10%

Final Paper- 35%

**Marine Reserve Project (30%):** Students will work in pairs throughout the semester to use ecological, oceanographic, and socioeconomic data to create a final proposal for the creation of a marine reserve. The first part of the project will entail having students choose a large marine ecosystem of interest, and then a specific region within this LME. Students will perform a literature review of all marine related factors and conservation issues pertaining to their region. They will then develop a proposal stating why the marine reserve is needed (based on scientific information), and how they would go upon developing the reserve based on the conservation needs of the region. A final 15 page proposal will be due at the end of the semester.

**Assigned Presentations & Class/Lab Exercises (25%):** Students will lead the class by selecting a marine conservation topic they wish to present, and then by choosing one additional paper for the class to read (papers should be chosen well before the week before class). Student presentations will be approximately 30 minutes; with 15 min reviewing the main scientific paper (supporting papers can be addressed in your presentation, but will not be the main focus). The remainder of time (10-15 min) will be used to lead a discussion and

guiding the ensuing discussion, bringing the discussion back on course when it becomes side-tracked, and re-energizing the topic when interest wanes. Intrinsic to this presentation will be the formulation of a 2 page double spaced summary of the topic along with a one page bibliography of relevant literature. Given the short length of your summary paper, you will need to be as succinct as possible in describing the relevant history of the topic along with a brief description of how the paper you presented supports or refutes the presiding theory on this topic. The main goal should be to show that you have learned this topic to a level that you could actually teach this topic to an undergraduate audience in the future. No web resources are allowed in the bibliography or summary.

Approximately a third of the lectures will involve marine ecology exercises. During these exercises, the professor will guide students through the working of problems or the use of computer programs (such as Vortex) to complete assignments. The assignments are meant to be partially completed during class, with the remainder of the work being completed as homework.

**Class Participation (10%):** Each week we will discuss the assigned reading articles in class. You should come to class having read the material to be discussed or having done the assignment and be prepared to contribute to the discussion of it.

**Final Paper (35%):** A paper of approximately 10-14 double-spaced pages (1.0 inch margins, 12 point font) giving a detailed review of some aspect of marine ecology and its relevance to conservation biology. The paper should be in the format (including the reference style) of the journal *Conservation Biology*. All topics must be approved by the instructor ahead of time to avoid duplication of topics by students in the class, and to avoid topics deemed inappropriate for the class. Paper topics should be proposed to the instructor by mid semester.

**Syllabus:**

Week	Topic
1	Introduction/Marine processes and primary production -Course expectations -Light and photosynthesis -Measurement of primary production -Seasonal trends in primary production
2	Productivity and marine food webs -Global trends in primary production -Energy stores and carbon -Food web dynamics and keystone species
3	Marine biodiversity -Biodiversity hierarchy in marine systems -Importance and value of biodiversity
4	Marine Processes -Implication on marine population biology on conservation

	<ul style="list-style-type: none"> <li>-Settlement, recruitment and dispersal patterns</li> <li>-Spatial variation</li> </ul>
5	<p>Threats to marine biodiversity:</p> <ul style="list-style-type: none"> <li>-Nutrient over-enrichment</li> <li>-Invasive species</li> <li>-Overfishing</li> </ul>
6	<p>Extinction risk in marine species</p> <ul style="list-style-type: none"> <li>-Differences between extinction on land and sea</li> <li>-Fishing as an extinction risk</li> <li>-Extinction by loss of habitat</li> </ul>
7	<p>Metapopulation structure and marine reserves</p> <ul style="list-style-type: none"> <li>-Metapopulation dynamics</li> <li>-Marine reserve design and function with source-sink dynamics</li> </ul>
8	<p>Marine Protected Areas (MPA) and biodiversity</p> <ul style="list-style-type: none"> <li>-Are MPA's effective conservation tools?</li> <li>-Persistence of populations in reserves</li> <li>-Guest Lecture (30 min): Marine Biologist, Kate Holmes (AMNH)</li> </ul>
9	<p>Marine Ecosystem Approaches to Management</p> <ul style="list-style-type: none"> <li>-Ecosystem Approaches to Management (EAM)</li> <li>-Large Marine Ecosystems (LME's)</li> <li>-Sustainable Yield</li> </ul>
10	<p>Disturbance and climate change</p> <ul style="list-style-type: none"> <li>-Multiple stressors in marine systems</li> <li>-El niño and La niña</li> <li>-Importance of marine system in climate regulation</li> </ul>
11	<p>Fisheries: Sustainability and Conservation</p> <ul style="list-style-type: none"> <li>-Status of global fisheries</li> <li>-Destruction of bottom habitat</li> <li>-Evolutionary impacts of fishing on target populations</li> <li>-How do we define sustainability?</li> </ul>
12	<p>Recovering Populations and Restoring Ecosystems</p> <ul style="list-style-type: none"> <li>- Restoration of coral reefs</li> <li>- Restoring functionality in marine communities</li> <li>-Guest lecture (30min). Dr. Alonso Aguirre (TBD)</li> </ul>
13	<p>Case Studies in Marine Conservation-Guest lectures (proposed) : Dr. Howard Rosenbaum, Dr. Genia Naro-Maciel</p>
14	<p>Marine Conservation Policy</p>

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|  | <ul style="list-style-type: none"><li>-Marine Mammal Protection Act (MMPA)</li><li>-Magnuson-Stevens Fisheries Protection Act</li><li>-Endangered Species Act</li><li>-International Whaling Commission</li></ul> |
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