Fall 2008 **Aquatic Community Ecology (BIOL 312)**

Instructor: Isidro Bosch, Professor of Biology
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Office Hours: Monday 3:00 to 4:30 PM, Th 3:00-4:30, F 10:30-11:30

Course Schedule: TR Lecture: 11:20-12:35 ISC 114; W Lab 2:45-5:35 in ISC 107 (4 cr: 3-3)

Course Description

This course presents an overview of the ecological organization and dynamics of the biological communities and ecosystems that dominate freshwater and marine ecosystems and examines the impact of human activities on the integrity of these systems. Classroom activities will provide a survey the major forces that influence community structure and function and the scientific research that contributed to this understanding. Regularly scheduled discussions of readings from the primary literature will focus on basic ecological principles as well as environmental issues and conservation. Field surveys and practical analytical and quantitative techniques will be the primary focus of the laboratory portion of the course. Students are required to participate on a trip to a marine station scheduled for September 24 -28 (Wed-Sun). While at the marine station the class will meet for lectures and field trips as determined by the instructor in accordance with weather, tides, and other scheduling considerations. The estimated cost per student for the trip is $130-150.

Pre-requisites: Biology 203 or a comparable Ecology course

Readings: There is no required textbook (see comments below). The instructor will assign readings from the scientific literature and provide the articles as pdf files or other medium.

Intended Learning Outcomes:

To achieve minimum competency in this course should be able to:

- describe and critically evaluate the key physical and biological processes that determine the organization and dynamics of freshwater and marine communities and ecosystems;
- identify common patterns in the organization and dynamics of aquatic systems
- demonstrate an understanding of human activities disrupt the balance of aquatic ecosystems, and critically evaluate potential strategies for management and mitigation of such problems
- demonstrate practical competence in carrying out selected analytical procedures and quantitative data analyses utilized in aquatic biology
- communicate orally and in writing in a manner that is effective for the discipline
- effectively communicate biological information to an audience of non-biologists

The first three learning outcomes will be assessed primarily through three exams and one essay final. Learning outcome four will be assessed primarily through field and laboratory activities and analyses. Success in meeting the fourth learning outcome will be determined by performance in field and laboratory sampling exercises. Outcomes five and six will be assessed through a requirement for two oral presentations and writing assignments based on ecological studies carried out by the class.

Field Trip to Marine Lab:

On September 24-28th we will travel to the Darling Marine Center, located near Damariscotta along the central coast of Maine. We will visit representative marine habitats and conduct quantitative and qualitative ecological surveys of marine communities. Classroom time will be devoted to discussions of ecological issues that are relevant to the Maine coast. We will be sharing the marine lab facilities with students and scientists from the University of Maine and other institutions. Geneseo students are expected to show exemplary behavior in accordance with College guidelines for student behavior, and to cooperate with the instructor at all times during this trip.

Grading:

The final course grade will be determined by the student's performance in four exams, two oral presentations, one discussion session, two research reports, a natural history essay, and participation in laboratory activities and class discussions. More specific instructions will be provided with each assignment.

Exams: a total of four exams worth 48% of the final grade; the final is integrative
Data Presentation: Students working in pairs are responsible for presenting an analysis of a biological/physical/chemical trend in Conesus Lake or among the Finger Lakes.
Discussion: individual students are required to lead a class discussion of a scientific paper assigned by the instructor; preparation and effectiveness in leading the class in the discussion will be evaluated.
Essay : an essay (~ 5-8 pp) describing the phenomenon of vertical zonation of species in the rocky intertidal zone of coastal Maine based on our own data analysis, written for the lay person in the style of popular scientific magazines.
Research Presentation: in pairs, a 15 min oral presentation based on literature research of a selected topic related to this course. Topic requires instructor approval.
Research Report: formal written report based on analyses carried out in the laboratory portion of the course. The report will follow standard scientific journal format.
Participation: includes preparation for class and laboratory activities; participation in field trips, environmental analyses and laboratory activities; and contributions to the dynamics of class discussions.

Total Score	Grade Scheme
93-100 %	A
89 - 93	A-
86 - 89	B+
82 - 86	B
79 - 82	B-
76 - 79	C+
71 - 76	C
66 - 71	C-
61 - 66	D
< 61	E

Assignments, Grading and Due Dates	% of Grade
3 MT exams (9/9, 10/9,11/25)	5%, 15%, 20%
Data Presentation (10/7)	6%
Research Report (10/123)	15%
Lead Discussion (TBD)	5 %
Essay on Intertidal (11/12)	10 %
Research Presentation (12/16)	10%
Final Exam Essay (12/16)	8 %
Participation	6 %

Readings:

There is no required textbook since no single textbook provides adequate coverage of both freshwater and marine community ecology. Our readings for lectures and group discussions will be from the scientific and popular literature. Articles will be made available primarily in digital format. Reading assignments listed by first author are included in the syllabus.

Fieldwork:

For the laboratory portion of this course we will frequently collect field samples and bring them back to the laboratory for analysis. Because this can be difficult to accomplish in one lab session, we will sometimes collect samples outside of scheduled laboratory ours. Students will have the option of volunteering for these collecting trips. Participation in any fieldwork conducted during lab time is required.

Readings for Aquatic Community Ecology (Biol 312 FALL 2008)

1. Anderson, D.M. 2003. Harmful Algal Blooms. Testimony Before U.S. House of Reps. Dept. MS #32. Woods Hole Oceanographic Institution, Woods Hole MA. 21 pp
2. Baker, A.C. 2001. Reef corals bleach to survive change. ***Nature*** #411: 765-766
   Baker , A.C. *et al*. 2004, Corals' adaptive response to climate change. ***Nature*** #430: 741
3. Bako, A.R. and C.R. Smith. 2003. High species richness in deep-sea chemoautotophic whale skeleton communities. ***Mar.Ecol.Prog.Ser.*** #260: 109-114
4. Best, M.D. and K. E. Mantai. Growth of *Myriophyllum*: Sediment or Lake water as the Source of Nitrogen and Phosphorus? ***Ecology*** # 59: 1075-1080
5. Blain, *et al*. 2007. Effect of natural iron fertilization on carbon sequestration in the Southern Ocean. ***Nature*** #446: 1070-74
6. Carpenter, S.R. & K.L. Cottingham . 1997. Resilience and Restoration of Lakes. ***Conservation Ecology*** # 1: pg 2
7. Carpenter S.R. & J.F. Kitchell. 1988. Consumer Control of Lake Productivity. ***BioScience*** #38 764-769.
8. Carpenter, S.R. et al. 1998. Nonpoint pollution of surface waters with phosphorus and nitrogen. ***Ecological Applications*** #8: 559-568
9. Cummins, K.W. 1974.Structure and Function of Stream Ecosystems. ***BioScience*** 24: 631-641
10. Estes et al. 1998. Killer Whale Predation on Sea Otters Linking Oceanic and Nearshore Ecosystems. ***Science*** #282: 473-475
11. Elner, R.W. & R.L.Vadas. (1990) Inference in Ecology: The Sea Urchin Phenomenon in the Northwestern Atlantic. ***Amer. Nat.*** # 136: 108-121.
12. Franks, P.J.S. & D.M. Anderson. 1992. Toxic Phytoplankton Blooms in the Southwestern Gulf of Maine: Testing Hypotheses of Physical Effects Using Historical Data. ***Marine Biology*** #112:165-174
13. Gross, *et al*. 2000. Experimental evidence for changes in submersed macrophyte species composition caused by the herbivore *Acentra ephemerella*. ***Oecologia*:** 127:105-114
14. Hilsenhoff, W.L. (1988). Rapid Field Assessment of Organic Pollution With a Family-Level Biotic Index. ***J. N. Am. Benthol. Soc***. 7:65:68
15. Hughes, TP. 1994. Catastrophes, phase shifts and large-scale degradation of a Caribbean coral reef. ***Science*** 265: 1547-1551.
16. Jackson, J.B. 2003. What was natural in the coastal oceans? ***PNAS***. #98: 5411-5418.
17. Lubchenco, J. 1978. Plant Species Diversity in a marine Intertidal Community: Importance of Herbivore Food Preference and Algal Competitive Abilities: ***Am Nat.*** 112: 23:39.
18. Menge, B.A. *et al*. 2003. Coastal oceanography sets the pace of the rocky intertidal community dynamics. ***PNAS*** 100:12229-12234.
19. Mumby, P.J. *et al*. 2004. Mangroves enhance the biomass of coral reef fish communities in the Caribbean. ***Nature*** 427: 533-536.
20. Peckarsky, B.L. 1982. Aquatic Insect Predator-Prey Relations**.** ***BioScience*** 32: 261-266
21. Ricciardi, A. and MacIsaac. 2000. Recent Mass Invasion of the Northern American Great Lakes by Ponto-Caspian Species. ***Trends in Ecology and Evolution*** 15: 62-65
22. Schindler, D.W. 2006. Recent advances in the understanding of eutrophication. ***Limnology and Oceanograph****y* 51: 356-363.
23. Townsend, C.R. 1991. Community Organization in Marine and Freshwater Environments pp. 125-144 *in* **Fundamentals of Aquatic Ecology** Ed. R.S.K. Barnes & K.H. Mann Blackwell.
24. Vanderploeg H.A. *et al*. Zebra mussel selective filtration promoted toxic Microcystis blooms in Saginaw Bay (Lake Huron) and Lake Erie. ***Canadian J. of Fisheries and Aquatic Sciences*** 58: 1208-1221
25. Zhu, B. et al. 2006. Alteration of ecosystem function by zebra mussels in Oneida Lake: impacts on submerged macrophytes. ***Ecosystems*** 9:1017-1028.