OCN 628 - BENTHIC BIOLOGICAL OCEANOGRAPHY

Fall 2009, MWF 830-920 am, MSB 307; Lab F 230-500 pm, MSB 315
Instructor: Craig Smith, office hours: MW 1430-1530 MSB 617
Guest lecturers: Guangyi Wang, Victor Evrard, Fabio De Leo, Les Watling, Rob Toonen, Bob Richmond, Steven Stanley

OUTLINE OF LECTURES

Date	Topic
	I. INTRODUCTION
Aug 24	A. Course Goals and Characteristics of Benthos
	II. THE PHYSICAL ENVIRONMENT
26	A. Physics of Bottom-Boundary Layers
28, 28_{lab}	B. Sediments--Structure, Flux and Transport
	III. MICROBIAL PROCESSES AND GEOCHEMISTRY
31, Sep 2	A. Microbial Processes - Wang
Sep 4, 4_{lab}	B. Molecular approaches for studying microbial biodiversity and ecosystem function in sediments - Wang
9	B. Basic Sediment Geochemistry
11	C. Diagenetic Modeling
	IV. BASIC BIOLOGICAL CONSIDERATIONS
	A. The Organisms (handout only)
	B.Sources of Data
14	a. Observation, Sampling, Experiments
16	b. Stable Isotopes and benthic ecology - Evrard
18	C. Development Types and Dispersal
	.
	D. Consumption and Production
21(*SQ 1 ass.)	a) Suspension feeding
23	b) Scavengers
25, 28 (SQ 1 due)	c) Deposit feeding
	i) basic considerations
30	ii) models of deposit feeding

V. OBSERVED PATTERNS AND SOME EXPLANATIONS

1. Soft Bottoms

Oct 2 A. Within-Community Patterns
- a) Size patterns
- b) Spatial patterns
- c) Temporal patterns

5 (SQ 2 ass.) B. Across Community Correlations

7 C. Pollution Gradients

9 D. Zonation and Biogeography

1. Inputs and outputs

12(SQ 2 due) A. Food Webs and Energy Flow

14 B. Recruitment and Adult-Larval Interactions

VI. COMMUNITY-LEVEL STRUCTURE AND PROCESSES

16, 19 1. Ecology of Submarine Canyons – De Leo

2. Vents, Seeps, Whale Falls and Other Reducing Habitats

21 A. Vent-Seep Habitat Characteristics

23 B. Microbiology

26 C. Macrobiology

28 E. Other reducing habitats

30 (SQ 3 ass.) F. Ecology of Whale Falls

Nov 2 3. Larval dispersal and population connectivity - Toonen

4 No class

6 4. Ecology of Seamounts – Watling

9, 13 (SQ 3 due), 16 5. Coral Reefs - Introduction; coral spawning, hybridization and speciation; recruitment of corals; the effects of environmental quality on reproduction and recruitment success – Richmond

18, 20 6. Bentho-pelagic coupling (esp. high latitudes)

20_{lab} 7. History of Marine Biodiversity – Stanley

******* PROPOSAL TOPICS DUE NOV 20*******

8. Population Interactions

23, 25 A. Disturbance, Colonization, Succession
- a) Sources and scales of disturbance
- b) Modes and rates of colonization
- c) Models and mechanisms of succession

30 B. Competition

Dec 2 C. Trophic-group Amensalism and Predation

4_{lab} ******* PROPOSAL PRESENTATIONS ********

D. Species Invasions

4 a) Mangroves: A Hawaiian Invasion

VII. HUMAN IMPACTS AND ECOSYSTEM MANAGEMENT

7 1. Antropogenic changes in benthic habitats

9 2. Design of Marine Protected Areas (MPAs)

******* PROPOSALS DUE IN CLASS WED, DEC 9 *******

14 ******* FINAL EXAM, MONDAY DEC 14 *******
7:30-9:30 am, MSB 307

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*SQ = Study Question.

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SCHEDULE OF LABORATORIES
Fall 2009, Friday 230-500 pm
Instructor: Craig Smith
Guest Lecturers: Grieg Steward, Guangyi Wang, and Bob Richmond

Date	Topic
8/28	Make-up lecture: Sediments – Structure, flux and transport; BBC *Blue Planet Tidal Flat Ecology*
9/4	Molecular approaches for studying microbial biodiversity - Wang
9/11	Sediment traps: theory, design, pitfalls, applications
9/18	Discussion #1: Stable Isotopes and Pulse-chase experiments in benthic ecology (Evrard)
9/25	Macrobenthos methods and field trip to Paiko Lagoon
10/2	Analysis of macrobenthic samples from sand and mud habitats
10/9	Deposit feeding – live observations and experiments
10/16	Discussion # 2: Topic TBA (Srsen)
10/23	Mangrove/Coconut Island field trip (Evrard, Smith)
10/30	**Midterm Exam**, Makeup lecture: Recruitment and Adult-Larval Interactions
11/6	Discussion # 3: Topic TBA (DeLeo)
11/13	Corals lab or field trip – Richmond, Smith
11/20	Makeup lecture: History of Marine Biodiversity – Stanley; Discussion # 4: Corals and climate change
12/4	**Proposal presentations**

Student Learning Outcomes:

1) Students will develop an understanding of how biological and physical processes influence the abundance, biodiversity and productivity of seafloor organisms in space and time in the ocean.

2) Students will develop an understanding (both qualitative and quantitative) of the influence of seafloor biological processes on the transformation and fluxes of energy and materials in the oceans.

3) Students will develop an understanding of the impact and management of human activities on seafloor ecosystems, including known impacts of fishing, eutrophication, and climate change, and the principles of marine protected area design.

4) Students will gain experience in critical thinking and discussion of research questions and scientific papers in biological oceanography.

5) Students will gain experience in writing and reviewing NSF style proposals for research funding.