Deep-Sea Biology (OCN630) - Syllabus

Fall 2013

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T TH 12:00-1:15

POST708

Syllabus schedule subject to change

Course Goals – The deep sea is the largest living space on the planet. Its inhabitants are varied and its communities are often complex, adapted to the particular characteristics of their habitat. This course will cover the major topics in the field, such as bentho-pelagic coupling, depth zonation, energetics, diversity, ecosystem function, adaptations, and the ecology of major habitats. The last portion of the course will deal with anthropogenic threats such as deep-sea fisheries, mining and global climate change. Its goal is to provide you with a basic understanding of what we know (and don't know) about the biology, ecology and biodiversity of deep-sea ecosystems, the methods used in the field, and it will create a forum for discussion of the major current questions and recent exciting discoveries.

Course Structure – After each lecture (or pair of lectures) students will lead a discussion session. The lectures will present the basics of the topics. The discussions will be based on assigned readings (primarily current scientific papers), allowing the class to explore the controversies, implications of recent findings, and highlight future directions for research.

Student Learning Outcomes – At the end of this course you will be able to:

1) Describe the co-varying effects of temperature, pressure, oxygen and light levels on the adaptations of deep-sea organisms.

2) Evaluate the influence of variables co-varying with depth on communities, populations, and species.

3) Discuss the various sources of energy available to deep-sea organisms and their controls on community processes.

4) Compare and contrast various deep-sea habitats and their faunas.

5) Evaluate the potential impacts of anthropogenic activities on deep-sea communities.

6) Read and understand a scientific paper, evaluate its findings and discuss the implications of those findings.

7) Synthesize a body of literature on a topic and communicate a clear synopsis of the background, controversies, and future directions for research orally.

Reading/Texts –

Gage and Tyler 1991. Deep-Sea Biology: A natural history of the organisms at the deepsea

floor. Cambridge University Press.

Optional - Herring 2002. The Biology of the Deep Ocean. Oxford University Press.

In addition readings will be assigned each week from the scientific literature.

Office hours – By appointment.

Date	**Lecture topic**
<u>Introduction</u>	
Aug 27	The physical environment and history of investigation (JCD and CRS)
Aug 29	Data collection techniques (JCD and CRS)
<u>Adaptations</u>	
Sept 3	Bioluminescence (JCD)
Sept 5	Physiological adaptations (JCD)
Sept 10	Discussion: *Bioluminescence* and *Physiological adaptations* papers
Sept 12	Energetics (JCD)
Sept 17	Discussion: *Energetics* papers
Sept 19	Pelagic-benthic coupling – Food supply (JCD and CRS)
<u>Community Composition and Dynamics</u>	
Sept 24	Depth zonation, trends in body size and the source-sink hypothesis (CRS)
Sept 26	Discussion: *Depth zonation* and *Source-Sink Hypothesis* papers
Oct 1	Diversity and Evolution – local and regional patterns (CRS online)
Oct 3	Discussion: *Diversity and evolution* papers
<u>Habitats</u>	
Oct 8	Seamounts/pop connectivity (TBD)
Oct 10	Discussion: *Seamount papers*
Oct 15	Deep Sea Microbes (Matt Church)
Oct 17	**Midterm**
Oct 22	Canyons and Trenches (JCD online)
Oct 24	Discussion: *Canyons and Trenches*
Oct 29	No class: Instructors at sea
Oct 31	Hydrothermal vents (CRS), **Topics due**
Nov 5	Cold seeps and whale falls (CRS)

Nov 7 Discussion: *Vents, Seeps and Whale-fall* papers

Nov 12 Oxygen Minimum Zones – present and future (JCD)
Nov 14 Discussion: *OMZ* papers

Anthropogenic effects

Nov 19 Fisheries (JCD)
Nov 21 Mineral Exploitation (CRS)

Nov 26 Discussion: *Fisheries and Mineral Exploitation* papers

Dec 3 Climate change (JCD and CRS)
Dec 5 Discussion: *Climate Change* papers

Dec 10 Topic presentations
Dec 12 Topic presentations

Dec 17 **Final Exam** (12:00-2:00)

Graduate Grading Scheme

Paper discussion	50 points
Topic presentation	75 points
Midterm	75 points
Final	75 points
Total	275 points

Paper discussions (sessions to be divided evenly amongst students)
Each student will be assigned a paper (typically one per topic) for which they will lead discussion - you will be assigned ~3 papers across different discussion topics
75 minute class periods will be divided into the discussion of ~2 papers (each lead by a different student)
Provide an outline for the discussion of each paper on PowerPoint, presenting:

The rational for study
Hypotheses or goals
Major findings
Conclusions

Be prepared with one or two questions per paper to stimulate discussion, addressing strengths, weaknesses, significance, and future directions for each paper.

You will receive an evaluation of your presentation by your instructors

Your course grade on this subject is also dependent upon your participation in discussions led by your colleagues

Topic Presentations

Choose a topic relating to deep-sea biology and review it (10-15 papers) via a 15 minute presentation

Introduce the topic, why you chose it, review the major results and conclusions

Summarize by identifying where the gaps are and critiquing progress in the field

15 minutes + 5 minutes for questions

Presentation (PowerPoint file) with bibliography due at time of presentation

Evaluated by your peers and instructor

Topics due Oct 31st - email a paragraph describing your topic to the instructors