Deep-Sea Biology (OCN430) - Syllabus

Fall 2017

Instructors: Jeff Drazen, office MSB605, jdrazen@hawaii.edu, 956-6567
Craig Smith, office MSB617, craig.smith@hawaii.edu, 956-7776

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) Describe 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) Describe 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.

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**
Introduction	
Aug 22	The physical environment and history of investigation (CRS)
Aug 24	Data collection techniques (CRS)
Adaptations	
Aug 29	Bioluminescence (JCD)
Aug 31	Physiological adaptations (JCD)
Sept 5	Deep Sea Microbes (Matt Church)
Sept 7	Discussion: *Bioluminescence* and *Physiological adaptations* papers – 3 papers
Sept 12	Energetics (JCD)
Sept 14	Discussion: *Energetics* papers - 2
Community Composition and Dynamics	
Sept 19	Depth zonation, trends in body size and the source-sink hypothesis (CRS)
Sept 21	Discussion: *Depth zonation* and *Source-Sink Hypothesis* papers - 3
Sept 26	Pelagic-benthic coupling – Food supply (JCD)
Sept 28	Diversity and Evolution – local and regional patterns (CRS - screencast)
Oct 3	Discussion: *Diversity and evolution* papers - 3
Habitats	
Oct 5	Seamounts – guest lecture, Astrid Leitner
Oct 10	Discussion: *Seamount papers* – 3
Oct 12	**Midterm**
Oct 17	Canyons and Trenches (JCD and CRS)
Oct 19	Discussion: *Canyons and Trenches* papers– 3
Oct 24	Hydrothermal vents (CRS)
Oct 26	Cold seeps and whale falls (CRS)
Oct 31	Discussion: *Vents, Seeps and Whale-fall* papers - 3
Nov 2	Mineral Exploitation (CRS)
Nov 7	Discussion: *Mineral Exploitation* papers – 3

Anthropogenic effects

Nov 9	Oxygen Minimum Zones (JCD)
Nov 14	Discussion: *OMZ* papers - 2
Nov 16	Fisheries (JCD)
Nov 21	Discussion: *Fisheries* papers - 3
Nov 23	Thanksgiving: no class
Nov 28	Climate change (JCD)
Nov 30	Discussion: *Climate Change* papers - 3
Dec 5	Discussion: papers TBD – grad students - 3
Dec 7	Topic presentations
Dec 12	**Final Exam** (12:00-2:00)

Grading Scheme

Paper discussion	25 points
Class participation	25 points
Midterm	75 points
Final	75 points
Total	200 points

Paper discussions (sessions to be divided evenly amongst students)
Each student will be assigned a paper (one per topic) for which they will lead discussion
75 minute class periods will be divided into the discussion of 2-3 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