THE BIOLOGY of LIVING in the OCEAN: BOUNDARY ECOSYSTEMS AND PROCESSES (11:628:462, 3 credits)

Instructors

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The ocean represents the majority of the Earth and represents the largest biome on the planet. This course covers the processes that regulate the biology, productivity, and population and community dynamics at the boundaries of the ocean, including intertidal zones, estuaries, salt marshes, coral reefs, hydrothermal vents, and the sea floor. The boundaries harbor charismatic ecosystems and the distinctive spatial structures provided by the boundaries shape the way in which these ecosystems function. The course will cover critical ecological themes such as the acquisition and transformation of energy and materials, population regulation, competition/predation dynamics, population connectivity, food webs, succession, and spatial structure.

Prerequisites

Calculus 1
General Biology 01:119:115–116
Dynamics of Marine Ecosystems 11:628:320

Recommended

General Chemistry 01:160:161-162
General Physics 01:750:193-194

Course Materials

Selected readings from the primary literature will be available through course website

Topics

Physical and chemical environment: Ocean depth zones; sediment properties; the rocky intertidal; estuaries; waves and currents
Primary production: Photoautotrophy, chemoautotrophy, symbioses
Secondary production: Heterotrophic bacteria; protozoa; suspension and deposit feeding; flow effects
Population growth: Components of population growth
Temporal variation: Death and supply-side
Fundamental niche: Determinants and examples (canyons, seamounts, upwelling zones)
Realized niche: Connectivity, life history, species interactions, competition, predation, physical and chemical factors
Succession and disturbance
Food webs

Species diversity
How define a community; biogeography
Biodiversity and ecosystem functioning
Anthropogenic effects: Fishing and habitat disturbance, climate change
Marine Protected Areas

Course Learning Goals and Assessment

The Learning Goals for the Marine Science program are posted on our website at http://marine.rutgers.edu/main/academics/undergraduate/program-description. The learning goals for this course apply to Program Learning Goal 1 (master the basic biological, chemical, physical, and geological principles of marine science), Goal 2 (analyze and interpret contemporary oceanographic datasets), Goal 3 (show evidence of scientific literacy and communicate the information effectively orally and in writing), and Goal 5 (evaluate contemporary global issues and the ethics of how the ocean's resources are used).

Students completing this course will be able to:

Goal A. Apply fundamental ecological principles to understand how marine organisms interact with each other and are affected by the chemical and physical properties of the ocean
Instructional activities: lectures, assigned readings, in-class discussions
Assessment method: performance on exams, active in-class participation

Goal B. Explain the physical and chemical oceanographic processes that affect primary and secondary production, and how they vary over space and time
Instructional activities: lectures, assigned readings, in-class discussions
Assessment method: performance on exams, active in-class participation

Goal C. Evaluate how energy and matter are transferred through marine food webs
Instructional activities: lectures, assigned readings, in-class discussions
Assessment method: performance on exams, active in-class participation

Goal D. Explain global patterns of benthic communities and the mechanisms driving them
Instructional activities: lectures, assigned readings, in-class discussions
Assessment method: performance on exams, active in-class participation

Goal E. Conduct an in-depth analysis of a current topic in marine ecology and communicate the results in a written term paper
Instructional Activities: guidance on using databases available through the Rutgers libraries and proper citation procedures
Assessment Method: submission of topic, submission of draft with minimum of 10 references from primary scientific literature, submission of final version incorporating instructors comments where appropriate

Grading

- Midterm 25%
- Final exam (comprehensive) 35%
- Term paper 15% draft, 15% final version
- Class participation 10%