LF216-18 Ecology and Environment

20/21

Department
Life Sciences
Level
Undergraduate Level 2
Module leader
David Scanlan
Credit value
18
Module duration
5 weeks
Assessment
100% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module is designed to give an overview of ecological principles and processes to aid an understanding of the natural world, and to provide a foundation for later studies for students with a special interest in environmental studies.

Module web page

Module aims

The overall aims of the module are to introduce the students to the major marine habitats, the ecologically significant groups of organisms, and the biological processes in the oceans that play a crucial role in regulating the global fluxes of major elements. The module also aims to introduce students to the contemporary techniques for the study of biodiversity and ocean productivity and how they are contributing to significant advances in our knowledge of biological ocean processes. Finally, the module aims to examine how anthropogenic influences are influencing the marine environment and, thereby, the climate.
This module is designed to give an overview of ecological principles and processes to aid an understanding of the natural world, and to provide a foundation for later studies for students with a special interest in environmental studies.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Lecture Outlines

Part A Biological Oceanography

1. The ocean and coastal environment (ARGP) - Introduction. Ocean circulation (surface circulation, upwellings, thermoclines, conveyors etc.) and other significant physico-chemical features of the marine environment (nutrients, salinity, pressure). Ocean realms and provinces.
2. Marine biodiversity (ARGP) - Concepts (e.g. genetic, biological, ecosystem diversity); assessment (direct and indirect). Comparison with terrestrial environments. Biological and environmental significance. (This lecture is particularly relevant to lecture 8 Molecular Approaches).
   3 From shallow to deep sea environments (DJS) - Definition of basic terms (plankton, pelagic etc.). Distributions of the classical, major marine systems (kelp beds, mangroves, seagrasses, coral reefs and sediments). Areal extent, productivity and biodiversity of each habitat. 4-5 How to sample the oceans (DJS) - Introduction to the major groups of organisms in the marine food web. The Microbial Loop. Major groups of phytoplankton. SHOULD BE AS FOLLOWS: 3 From shallow to deep sea environments (DJS) - Definition of basic terms (plankton, pelagic etc.). Distributions of the classical, major marine systems (kelp beds, mangroves, seagrasses, coral reefs and sediments). Areal extent, productivity and biodiversity of each habitat. 4-5 How to sample the oceans (DJS) - Introduction to the major groups of organisms in the marine food web. The Microbial Loop. Major groups of phytoplankton. 6 Photosynthetic picoplankton (DJS) - Discovery, physiology, adaptation to light climate, seasonal cycles, differences in pigment composition between the genera Synechococcus and Prochlorococcus. 7 Biogeochemical cycles (DJS) - The role of micro-organisms in the cycling of carbon, nitrogen, phosphorus and sulphur. What limits photosynthesis in the sea? 8 Nitrogen fixation in the sea. Microbiology of hydrothermal vent communities and adaptation to living at depth. (DJS) 9 Marine microbial interactions (DJS) - From single cells to streamlined genomes and microbial interdependence; ecological theories (red vs black queen); positive and negative interactions, viral lysis and grazing. 10 Molecular approaches (DJS) - Molecular approaches to assessing genetic diversity in the marine environment; the 'great plate count anomaly'; 16S rRNA analysis; PCR approaches. 11 Anthropogenic effects on the oceans (DJS) – increasing atmospheric CO2 and the buffering effect of the oceans, ocean acidification, eutrophication and harmful blooms. 12 Global climate change (ARGP) - Effects of changes in CO2 levels, temperature and sea-level rise. Increasing UV levels and biological consequences. Stress interactions. Socioeconomic implications. 13 Plankton, fisheries and protected areas (ARGP) - Spawning areas and other critical phases of migratory fishery species. Determination of spawning areas by plankton sampling. Marine reserves and protected areas. 14 Gulf War (ARGP) - Introduction and major events. Changes in zooplankton. Impact on the sea surface microlayer. Toxicity testing. Special assessment techniques for reef corals. Wider implications and conclusions. 15 Shifting marine environmental baselines (ARGP).

Assessing anthropogenic impact on marine systems over a historical timescale using examples from fisheries and coral reefs.

Learning outcomes

By the end of the module, students should be able to:

- Understand key ecological principles.
- Appreciate the complexity of ecosystems and the integration of ecological processes within these systems.
- Recognise the role of environmental influences on different levels of organisations within ecosystems.

Indicative reading list

Part A: Biological Oceanography
Some material from the second year Microbiology text book (Biology of Microorganisms, 15th edn. - Madigan, Bender, Buckley, Sattley, Stahl) will be useful for this module.

Lalli, C. M. and Parsons, T. R. Biological Oceanography: An Introduction, 2nd edn. (Butterworth Heinemann, 1997).
Munn, C. Marine Microbiology, 2nd edn. (Garland Science, 2011).
Part B: Ecological Principles and Processes

Krebs, C.J. Ecology: the experimental analysis of distribution and abundance. 6th Edition. Pearson Benjamin Cummings, San francisco

Townsend, C. R., Begon, M. and Harper, J. L. (2008) Essentials of Ecology,
3rd Edition. Blackwell Publ., Oxford.

Mayhew, P. J. (2006). Discovering Evolutionary Ecology; Bringing Together Ecology and Evolution. Oxford University Press.

Spellerberg, I. (2005). Monitoring Ecological Change, 2nd Edition. Cambridge University Press.

Subject specific skills

- Understand the physicochemical nature of the oceans in relation to the physiology of the major groups of oceanic organisms contributing to biogeochemical cycling.
- Describe the techniques used for identifying novel major groups of microorganisms.
- Explain the major oceanic food chains and concepts such as “the microbial loop.”
- Understand the ocean as the main driver of global biogeochemical cycles (e.g. the great oxygenation event and the buffering of anthropogenic CO2 emissions)
- Explain the types of interactions that occur and evolutionary theories that have developed from studying these habitats
- Understand the key features of classical and specialized marine habitats, and the nature of marine biodiversity.
- Describe acute anthropogenic impacts on the marine environment (using the Gulf War,

marine plastic debris and the fisheries industry as example), and chronic impacts on the marine environment (using global climate change as an example).
- Understand the key factors that determine the abundance and distribution of organisms in natural environments
- Describe how conditions and resources affect the abundance distribution of organisms and explain the underlying theory for this.
- Understand how single and multi-species populations change over time and the factors that mediate population dynamics.
- Explain how competition, predation and mutualisms affect the distribution and abundance of populations and influence the fitness of individual organisms.
- Explain how ecological communities are formed and understand how the interactions between member species influences the function of the whole community.

Transferable skills

Self directed learning
Adult learning
critical appraisal of source material

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (17%)
Private study	150 hours (83%)
Total	180 hours

Private study description

Self directed learning and revision for end of year exam

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group B1

	Weighting	Study time
In-person Examination	100%	

- Answer book provided by department

Feedback on assessment

There is no feedback for Y2 short answer examinations.

Past exam papers for LF216

Availability

There is currently no information about the courses for which this module is core or optional.