UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biodiversity

2627-1-F7504Q002-F7504Q00201

Aims

This course examines biological aspects of ocean ecosystems and the physical processes that regulate them. Topics include the distributions, abundances, and interactions of marine organisms; interactions between organisms and the transformation and flux of energy and matter in marine ecosystems; and aspects of physiology related to marine species distributions, abundances and roles. Lectures facilitate understanding 1) the complex nature of the process that affect and control marine biodiversity; 2) become familiar with multiple definitions and measures of marine biodiversity; 3) identify threats to marine biodiversity and what mechanisms are developing to identify and manage biodiversity loss; 4) of the impact and rapid spread of non-indigenous marine species, methods of introduction and spread, and current control measures; 5) gain knowledge of how major fisheries management programs relate to biodiversity loss and conservation. 6) measure the success/failure of current action strategies, such as Marine Protected Areas, by applying lessons learned and incorporation of emerging methods and data sources

D1 – Knowledge and understanding:
During lectures, students will learn about the multimensioanl components of the biodiversity concept, and its evolution in the anthropocene epoch.

D2 – Applying knowledge and understanding:
During interactive lectures students will apply the acquired knowledge to case studies in order to analyse the effect of anthropogenic impacts on temporal and spatial patterns of marine biodiversity.

D3 – Making judgements:
During interactive lectures, students will learn how to critically evaluate the approaches described in the analysed scientific papers and compare different interpretations.

D4 – Communication skills:
During interactive lectures, students will be able to collaborate within working groups, contributing to the discussion of the analysed scientific papers and to the exchange of ideas with other students and the lecturer, using appropriate scientific terminology.

D5 – Learning skills:
Students will develop their learning skills throughout all phases of the course and will be able to independently expand their knowledge through the research and critical reading of scientific papers related to the topics covered.

Contents

Introduction to Marine Biodiversity; Biodiversity of Plankton, Benthos and Nekton; Spatial and Temporal Patterns of Marine Biodiversity; Global threats and for global Biodiversity and Anthropogenic Impacts; Coral Reef's biodiversity; Marine fisheries and Biodiversity.

Detailed program

1- Introduction to Marine Biodiversity

Definition of Biodiversity , Who “owns” Biodiversity? How is it measured and why is it important: Genetic diversity; how is it defined/measured? genes, populations; Species diversity; how is it defined/measured?; Ecosystem diversity; Functional diversity; The magnitude of the known marine biodiversity

2- Marine Biodiversity – Plankton, benthos, nekton

Planktonic diversity classification by size, distribution, lifestyle, general description of the realm, major taxa, magnitude of diversity and biodiversity functioning; Benthos diversity classification by size, distribution, habitat, lifestyle, feeding behaviour. General description of the realm, major taxa, magnitude of diversity and biodiversity functioning; Nekton diversity classification by, size, distribution, habitat, lifestyle, feeding behaviour. General description of the realm, major taxa, magnitude of diversity and biodiversity functioning

3- Spatial and Temporal pattern of Marine Biodiversity and Conservation of the Ocean

Spatial and temporal patterns

Factor in Biodiversity (speciation-extinction); Biogeographic factors; Major gradient of species diversity (latitudinal, longitudinal, bathymetric); Explanation of regional diversity differences; Expansion and Extinction in the Past; How extinctions change biodiversity: (a) Two kinds of extinctions; natural, induced – extinction rate-(b) The implications of extinction-(c) Earth's past mass extinction events - (d) The current mass extinction event - (e) Generalizations we can draw from past extinction events

Conservation of marine biodiversity

Value of Marine Biodiversity; Why is important? Ecosystem function and services; The shifting baseline concept; What is an endangered species; The IUCN red list; CITES; Conservation strategies (MPAs)

4- Global Threats for Global Biodiversity and Anthropogenic Impacts

Threats to Marine Biodiversity

Human effects on Marine Environment; Pollution (toxic metals, pesticides, herbicides); the problem of the Plastic; Biological Invasion; Nutrients and Eutrophication; Global Environmental Change and the Ocean

The Hidden Diversity of the Coral Reef

The Holobiont (members and habitats); The coral probiotic Hypothesis; The Hologenome theory of evolution; The coral Symbiome; Impact of Environmental stress on the coral Symbiome

The coral diseases

Terminology and definitions; History and actual distribution; Koch's postulates; Skeleton Eroding Band, Brown Band Disease, White Syndrome, Ulcerative White Spot, Black Band Disease, Tumors; Divers of coral disease outbreaks; Vectors and Reservoirs; Management issue and Actions

5- Marine Fisheries and Biodiversity

Fisheries and food from the Sea

What is a fishery; Stock - a key concept; Fishing techniques and their effects (Longline fishery, Purse seine, Trawls, Gill nets); Magnitude and Impacts

Marine Fisheries and Biodiversity – Overfishing

Definitions; Vulnerable resource species; The case: Terranova Grand banks; The impact of the overfishing; The case of Tuna fisheries; The waste; The food fraud; Illegality: shark finning, flag of convenience, IUU definitions

Marine Fisheries and Biodiversity – Fishing Management

Aged-based population; Closures and quotas- quotas and Individual transferable quotas; Mariculture; MPAs;

The roles of consumers

Prerequisites

no

Teaching form

14 two-hour lectures, in person, Delivered Didactics - DE

12 two-hour lectures, in person, Interactive teaching - DI

Textbook and teaching resource

- Power point presentations

- Marine Biology: Function, Biodiversity, Ecology (3°edition). Jeffrey S. Levinton, Oxford University Press

- Marine Ecology: Processes, Systems, and Impacts (2° edition). Michel J. Kaiser et al., Oxford University Press

- Scientific Papers

Semester

first semester

Assessment method

The exam will be composed of a 10 min (max) power point presentation of a scientific article and an oral examination of the topics covered during the course.

During the oral exam, the understanding of the topics covered in class will be assessed through both general and specific questions, as well as the ability to make connections between concepts, think critically, and use appropriate scientific language

In particular there will be questions related to:

- questions related to the presentation (INTERVIEW)

- questions related to the course (INTERVIEW)

The final grade is expressed on a 30-point scale and will be based on the following criteria:

D1 – Knowledge and understanding
D2 – Applying knowledge and understanding
D3 – Making judgements
D4 – Communication skills
D5 – Learning skills

Assessment below 18/30
D1: The student demonstrates fragmented theoretical knowledge.
D2: The student is unable to integrate knowledge into a complete analysis of case studies.
D3: The student processes information inaccurately and incompletely and is unable to critically elaborate on the concepts.
D4: During the presentation and/or oral examination, the student does not use appropriate scientific terminology and communicates in an unclear and ineffective way.
D5: The student does not demonstrate awareness of their learning process and is unable to identify the essential connections among the topics addressed.

Assessment 18–22/30
D1: The student demonstrates fairly complete theoretical knowledge, although with some inaccuracies.
D2: The student integrates knowledge into the analysis of case studies, but in an incomplete way.
D3: The student is able to discuss concepts critically at a basic level, with some inaccuracies.
D4: During the presentation and/or oral examination, the student uses appropriate scientific terminology, although with some inaccuracies, and communicates in a reasonably clear way.
D5: The student demonstrates a basic awareness of their learning process and is able to identify some essential connections among the topics addressed.

Assessment 23–27/30
D1: The student demonstrates complete and in-depth theoretical knowledge.
D2: The student satisfactorily integrates knowledge into the analysis of case studies.

D3: The student is able to critically and coherently discuss concepts, showing good ability to elaborate information.
D4: During the presentation and/or oral examination, the student demonstrates good command of scientific terminology and communicates clearly and effectively.
D5: The student demonstrates good awareness of their learning process and is able to highlight the connections among the different components analysed.

Assessment 28–30/30
D1: The student demonstrates complete, in-depth, and rigorous theoretical knowledge.
D2: The student demonstrates an advanced ability to integrate knowledge for the analysis of case studies and the interpretation of the analysed data.
D3: The student is able to critically and coherently discuss concepts, elaborating information in a solid and articulated way, with a well-structured logical approach.
D4: During the presentation and/or oral examination, the student demonstrates excellent command of scientific terminology and communicates clearly and effectively.
D5: The student demonstrates advanced awareness of their learning process and is able to connect the different components analysed in an effective, coherent, and rigorous way.

Mark range: 18-30/30

Office hours

monday 8:30-10:30

Sustainable Development Goals

LIFE BELOW WATER