



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Biodiversity

2223-1-F7502Q004-F7502Q004M

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#### 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

#### 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**

\_ Lessons: 4 credits

- Tutorials: 2 credits

During the COVID-19 restrictions the lessons will be recorded and available online, with some live events that will be planned and communicated on e-learning

### **Textbook and teaching resource**

#### **- Power point presentations**

- Marine Biology: Function, Biodiversity, Ecology (3<sup>o</sup>edition). Jeffrey S. Levinton, Oxford University Press

- Marine Ecology: Processes, Systems, and Impacts (2<sup>o</sup> edition). Michel J. Kaiser et al., Oxford University Press

- Scientific Papers

### **Semester**

first semester

### **Assessment method**

oral examination based on:

- power point presentation of a scientific article

- questions related to the presentation

- questions related to the course

the exam will be on-line

### **Office hours**

monday 8:30-10:30

### **Sustainable Development Goals**

LIFE BELOW WATER

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