UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biodiversity and Animal Conservation

2526-1-F0602Q121

Aims

This course examines the **definitions, patterns, estimates and conservation of animal biodiversity**. Topics include planning a biodiversity research, techniques and analyses to be used to study animal biodiversity, conservation biology and genetics, threats to biodiversity, instruments to manage, preserve and restore animal biodiversity.

1. Knowledge and understanding skills: Students will come to know the key and in-depth concepts of biodiversity, from definitions, to patterns in time and space, to planning scientific research involving biodiversity, to the main analytical techniques (with focus on molecular analyses) for the study of biodiversity and biodiversity conservation, to the national and international legal framework regarding biodiversity-related topics.
2. Ability to apply knowledge and understanding: Students will be able to apply the acquired knowledge to case studies on the topic of animal biodiversity characterization and conservation.
3. Autonomy of judgment: Students will be able to independently identify the most effective issues and methodologies for the study and conservation of biodiversity in current case studies.
4. Communication skills: Students will be able to express clearly and scientifically about biodiversity topics, including through the final exam in which they will have to present recent scientific studies.
5. Learning skills: Students will know how to independently investigate topics related to the topic of biodiversity and will know how to integrate their acquired knowledge with future teachings on animal diversity, ecology, and evolution.

Contents

Definitions and estimates of biodiversity, instruments and techniques to study and preserve animal biodiversity, conservation biology and genetics.

Detailed program

What is the biological diversity.
Introduction and structure of the course. Definitions of biodiversity from genes to ecosystems and functional biodiversity. Measuring biodiversity.

Patterns of biodiversity.
The magnitude of the known animal biodiversity. Temporal and spatial patterns of animal biodiversity. Biodiversity hotspots.

Threats to animal biodiversity.
Human impacts and their effect on animal biodiversity. Habitat degradation, loss, and fragmentation. Pollution. Overexploitation. Invasive species and diseases. Global climate change.

Biodiversity, ecosystem functioning and services.
Contribution of animal biodiversity to ecosystem functioning and ecosystem services. The value of biodiversity and ecosystem services.

Planning a biodiversity research and sampling.
Planning a biodiversity research. Sampling strategies. Monitoring and sampling techniques.

Phenotypic and genetic variation.
Phenotypic diversity. Genetic diversity from chromosomes to single nucleotide polymorphisms.

Nucleic acid sequencing.
Nucleic acid extraction. Sequencing technologies from first to third generation sequencing. Sequencing methodologies including whole genome sequencing, reduced representation sequencing, transcriptomics and other ‘omics’.

Phylogenetic inference.
Theory and definitions. Methods for reconstructing phylogenies. Application of phylogenetics in animal biodiversity studies.

Population-level variation.
Introduction to population genetics. The Hardy-Weinberg principle and deviations from its assumptions. Genetic drift. Effective population size. Natural selection. Population subdivision. Gametic disequilibrium.

Evolutionary responses to impacts.
Hybridization, invasive species, exploited populations, and climate change.

Conservation genetics.
Inbreeding depression. Demography and extinction. Population connectivity. Conservation breeding and restoration. Genetic identification and monitoring. Conservation units.

Conservation planning and prioritization.
Species level conservation and the IUCN Red List. Site level conservation and protected areas. Ecosystem management. Animal conservation in urban landscapes. Restoration.

Legal framework of conservation biology.
Environmental laws and policies at the International and national level.

Seminars and case studies.

Prerequisites

None

Teaching form

All lectures will be in presence and will include: 90% of delivered didactics, through frontal lectures and seminars by experts (19 2-hours lectures); 10% of interactive teaching, through discussion on relevan topics and case studies concerning the study and conservation of animal biodiversity (two 2-hours lectures).

Textbook and teaching resource

PowerPoint Slides

Scientific Papers

Conservation Biology: Foundations, Concepts, Applications (3rd Edition). Fred Van Dyke, Rachel L. Lamb. Springer

Conservation and the Genomics of Populations (3rd Edition). Fred W. Allendorf et al. Oxford University Press

Semester

First semester

Assessment method

The examination will focus on the topics covered during the course and will begin with the presentation and discussion of a case study (scientific article) concerning one or more topics of the course (article to be agreed with the lecturer). Subsequently, knowledge of the topics covered in the lectures will be assessed either through general questions, where the student will have to demonstrate mastery of the course topics, ownership of language and ability to connect various topics, or through specific questions on particular concepts, techniques and case studies. Overall, the student must demonstrate both a thorough understanding of the topics and the ability to apply the techniques and knowledge learned to actual case studies.
There will be no in-progress exams.

Office hours

By appointment by sending an email to the lecturer (davide.maggioni@unimib.it)

Sustainable Development Goals

CLIMATE ACTION | LIFE BELOW WATER | LIFE ON LAND