UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Animals and Global Change

2627-1-F7603Q024-F7603Q02402

Aims

The module 'Animals and Global Change' provides a comprehensive understanding of animal biodiversity, its importance in terms of ecosystem services, and how these aspects are affected by global challenges such as climate change, habitat fragmentation, and invasive species. Students will learn methods for monitoring biodiversity and mitigating declines in species and ecosystem services through real-world case studies. The course fosters critical analysis by enabling students to assess conservation risks, understand impacts on ecosystem functionality, and evaluate the effectiveness of conservation interventions. As a result, they will be well-equipped to judge the efficiency of both targeted and comprehensive conservation strategies in line with international regulations. Additionally, the course strengthens communication skills, enabling students to effectively convey biodiversity value and associated risks to stakeholders, management bodies, and policymakers. The topics covered in this module are closely connected to the other two modules of the course, with co-participated analysis of case studies and discussions to reinforce the interdisciplinary relationship between biodiversity and sustainability.

Students are invited to consult the syllabus of the entire course for details regarding learning- and skill-related objectives.

Contents

• Basics of animal ecology and biodiversity.
• Animal biodiversity and ecosystem services.
• Global changes and drivers of animal biodiversity loss.
• Tools and metrics to quantify drivers of biodiversity loss.
• Tools and metrics to monitor and quantify animal biodiversity loss and evaluate the efficiency of conservation efforts.
• Biodiversity conservation practices and socio-economic impacts.

Detailed program

Introduction to animal biodiversity and ecosystem functioning
• animal biodiversity and its importance within ecosystems;
• levels of biodiversity, including genetic, species, and ecosystem diversity;
• the role of animals in maintaining ecosystem balance and functioning;
• concept of biodiversity hotspots;
• the importance of protecting endangered species.

Global risk factors for animal biodiversity and conservation efforts
• major global threats to animal biodiversity, including habitat loss, climate change, invasive species, over-exploitation, and pollution;
• impact of these threats on biodiversity;
• global conservation efforts aimed at mitigating these risks, such as protected areas and species recovery programs.

Metrics for quantifying and comparing animal biodiversity
• tools and methodologies for measuring animal biodiversity;
• species richness, evenness, and diversity indices;
• use of these metrics for comparing biodiversity across ecosystems and monitoring changes over time.

National and international regulations for animal biodiversity conservation
• overview of the legal frameworks that guide animal biodiversity conservation at both national and international levels;
• international agreements like the Convention on International Trade in Endangered Species (CITES);
• national policies such as endangered species protection laws;
• habitat conservation;
• biodiversity monitoring regulations.

Monitoring tools and approaches
• modern tools and technologies used in biodiversity monitoring, including satellite imagery, drones, camera traps, genetic sampling, and bioacoustic monitoring;
• large-scale, efficient, and accurate biodiversity assessments;
• conservation planning and decision-making.

Reference data sources
• key data sources used in animal biodiversity research and conservation;
• global biodiversity databases such as the IUCN Red List, GBIF (Global Biodiversity Information Facility), and Citizen Science Open Platforms;
• reliable data for informing conservation efforts.

Ecosystem benefits of animal biodiversity
• the vital role of animal biodiversity in providing ecosystem services, such as pollination, seed dispersal, pest control, and soil fertilization;
• the loss of animal species and its consequences for ecosystem functioning and human well-being;
• the interdependence between biodiversity and ecosystem services.

Economic and social value of animal biodiversity
• the economic and social value of animal biodiversity;
• ecotourism, sustainable fisheries and agriculture;
• analysis of costs of biodiversity loss and the economic benefits of maintaining healthy, biodiverse ecosystems;
• the social and cultural significance of animals in various societies.

Analysis of case studies (partially overlapping with the other two modules of this laboratory course)
• analysis of case studies from different regions and ecosystems;

• real-world examples of animal conservation successes and challenges, also in broader contexts.

Prerequisites

• Basic knowledge of biology.
• Basic knowledge of ecology.

Teaching form

2 CFUs of mixed theoretical and interactive lessons (20 hours):
• 7 two-hour lectures, in person, mostly frontal teaching and discussion in class, Delivered Didactics.
• 3 two-hour lectures, mixed didactics in the classroom, to collect information and critically analyse real-world case studies in common to other modules, Interactive Didactics.

Attendance to lectures and interactive exercises is highly recommended.

Textbook and teaching resource

• Slides shown during lectures.
• Additional material on selected topics, *i.e.*, scientific articles, made available on the e-learning website of the course.

Semester

II semester (March - June)

Assessment method

The final exam consists of a critical dicsussion of a case study common to the three modules of the laboratory course, with the discussion covering various topics covered in the course, with an emphasis on the connections between concepts and processes, such as to arrive at a critical evaluation of the analyzed case study from the point of view of sustainability in biodiversity conservation. A single oral exam at the end of the course is facultative: it may be a supplementary test requested by teachers or students.

The final score will be between 18/30 and 30/30 *cum laude*, based on the overall assessment considering the following criteria:
(1) knowledge and understanding;
(2) ability to connect different concepts;
(3) autonomy of analysis and judgment;
(4) ability to correctly use scientific language.

Office hours

Always, after scheduling an appointment *via* phone or e-mail.

Sustainable Development Goals

QUALITY EDUCATION | CLIMATE ACTION | LIFE BELOW WATER | LIFE ON LAND