COURSE DATA

Data Subject	
Code	33057
Name	Conservation biology
Cycle	Grade
ECTS Credits	10.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1100 - Degree in Biology	Faculty of Biological Sciences	4	Annual

Subject-matter

Degree	Subject-matter	Character
1100 - Degree in Biology	15 - Complements of biodiversity and conservation	Optional

Coordination

Name	Department
MONTERO PAU, JAVIER	275 - Microbiology and Ecology
PALERO PASTOR, FERRAN	194 - Genetics

SUMMARY

Conservation Biology is a multidisciplinary science that focuses on the study of nature and biological diversity with the aim of protecting species, their genetic diversity, their habitats, and ecosystems. The term, coined by biologists B. Wilcox and M. Soulé at a scientific conference held in 1978, seeks to combine the interaction between ecological theory and other biological, physical and social sciences, as well as with the policies and practice of biodiversity conservation, in a multiscale environment, ranging from intrapopulation diversity to the biosphere as a whole, and postulates actions that can also take place at different spatial and temporal scales. The current extinction crisis, accentuated by the rapid changes linked to global change, is leading to the disappearance of an important part of the planet's biodiversity. In this context, Conservation Biology deals with the phenomena that affect the maintenance, loss and restoration of biodiversity, as well as the processes that build up genetic, population, taxonomic, and ecosystem diversity. Increasingly, Conservation Biology interacts with the eco-sociological framework in which these processes occur and tries to give a global response to the current biodiversity crisis based on deep scientific knowledge, but also on an ethical attitude towards life.

The subject "Conservation Biology", corresponding to the intensification "Complements of Biodiversity and Conservation", aims to articulate with the rest of the subjects of the intensification and with those previously studied in the first three years of the degree, so that, serving as the central nucleus of the intensification, coordinating and complementing with the rest of the subjects, allows to give the student an integrated vision of the knowledge and to promote the necessary capacities to face the problem of the conservation of biological diversity in all its facets.

The fundamental objective of the subject is to provide knowledge to the student, theoretical and methodological, as well as criteria to understand and apply the basic principles related to the conservation of biological diversity. It is also intended that the future graduate will be able to design and implement plans for the conservation of biological diversity, in its different spatio-temporal scales, applicable at its different levels of organization, all based on a solid theoretical basis as well as on the application of criteria based on experience and judgement.

As a secondary objective, the subject will serve as the core of the intensification "Complements in Biodiversity and Conservation", and as a framework to apply other aspects learned and tested in previous courses of the Degree in Biology and in subjects studied in parallel during the intensification.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Generic requirements to study the intensification "Complements in Biodiversity and Conservation".

OUTCOMES

1100 - Degree in Biology

- Capacidad de análisis, síntesis y razonamiento crítico.
- Capacidad de organización, planificación y gestión de la información.
- Utilización del lenguaje científico oral y escrito.
- Uso del inglés como vehículo de comunicación científica.
- Capacidad de resolución de problemas y toma de decisiones.
- Capacidad de análisis crítico de textos científicos.
- Apreciación del rigor, el trabajo metódico, y la solidez de los resultados.
- Comprender las interacciones del hombre con el medio.

- Conocimiento y aplicación del método científico.
- Redactar y ejecutar proyectos en biología.
- Conocer la diversidad de los seres vivos.
- Conocer la diversidad de los ecosistemas.
- Comprender la problemática ambiental global, regional y local.
- Catalogar y evaluar recursos biológicos.
- Realizar análisis genéticos aplicados a la conservación.
- Conocer la estructura y dinámica de las poblaciones.
- Conocer las interacciones entre especies.
- Conocer los patrones de distribución geográfica de los organismos y sus causas.
- Realizar cartografías temáticas.
- Interpretar el paisaje y restaurar hábitat.
- Planificar la explotación racional de los recursos naturales renovables terrestres y marinos.
- Identificar las amenazas de los organismos en su ambiente natural y proponer medidas de conservación.
- Conocer métodos de enriquecimiento aplicados a animales en cautividad y su reintroducción.
- Capacidad para prever las consecuencias para la conservación de las diferentes estrategias.
- Analizar las repercusiones sociales y económicas de las diferentes estrategias conservacionistas.
- Capacidad para la planificación de estrategias de conservación.
- Muestrear y caracterizar comunidades y ecosistemas.
- Muestrear, caracterizar y manejar poblaciones.
- Capacidad de gestión y manejo de áreas protegidas.

LEARNING OUTCOMES

1 - Analyze and quantify genetic variability in a population.

2 - Apply different genetic markers and select the most appropriate for each problem.

3 - Evaluate the consequences of genetic drift.

4 - Apply the concept of effective population size in the context of the conservation of a population or species.

5 - Calculate the degree of kinship and inbreeding in a population.

9 - Analyze with direct and indirect methods the rates and patterns of migration between populations.

10 - Evaluate the consequences of the translocation and reintroduction of individuals from other areas.

11 - Analyze the metapopulational structure and the consequences of the dynamics of extinction-recolonization.

13 - Evaluate the genetic risk of extinction of populations / species.

15 - Design strategies for the conservation of populations and species.

16 - Control and monitoring of conservation measures.

18 - Assess the conservation of the vegetation of a territory

19 - Carry out conservation work in situ and ex situ

20 - Prepare recovery and management plans for endangered species

21 - Evaluation of biodiversity.

22 - Planning and design of networks of natural protected areas

23 - Make thematic maps

24 - Diagnose environmental problems

25 - Sampling, characterizing, and managing populations

26 - Sampling and characterization of communities and ecosystems

27 - Interpret the landscape and restore habitats.

28 - Plan the rational exploitation of terrestrial and marine renewable natural resources

29 - Identify the threats of organisms in their natural environment and propose conservation measures

30 - Diagnose environmental problems

32 - Evaluate the state of conservation of the species.

*Numbering corresponds to the results of the learning of the Verification of the curriculum

DESCRIPTION OF CONTENTS

1. SECTION I-I - GENERAL AND METHODOLOGICAL ASPECTS

1. Conservation Biology and Biodiversity. What is Conservation Biology? Principles and postulates. Biodiversity: concept. Levels of organization of biological diversity: genetic diversity, taxonomic diversity, diversity of communities and ecosystems. The new paradigm of non-equilibrium in nature and resilience of ecological systems: implications for biodiversity conservation. The sixth great extinction. (1 hour)

2. Importance of biodiversity conservation. The human species as a component of ecological systems.

The value of ecosystems and biodiversity. Natural capital. Intrinsic value and instrumental value. Ecological economics and sustainable development. The ecological footprint. Ecosystem processes, functions and services. The Millennium Ecosystem Assessment. Food security, sustainability and biodiversity conservation. The integration of conservation biology and biodiversity conservation policy. (2 hours)

3. The context of biodiversity conservation. Criteria for considering species as threatened. Threat categories of the International Union for Conservation of Nature. Umbrella and flag species. The role of society in conservation. International organizations. Non-Governmental Organizations. International agreements on biodiversity and their forums. The Convention on Biological Diversity. European Union legislation (Directives) relating to habitats, natural areas and species: State and regional legislation relating to habitats and species. (2 hours)

4. Biological diversity at different scales. Processes at different scales: historical-evolutionary, geographical and ecological. Quantification of global, regional (gamma) and local (alpha) diversity. Diversity spectra (beta diversity). From hot spots to micro-reserves. Applicability in conservation. (1 hour)

2. SECTION I-II - GENERAL AND METHODOLOGICAL ASPECTS

5. Biological diversity and the assembly of communities. Assembly rules. "Island" model: divergence in assembly. Character and environment" models: convergence in the assembly. Bidirectional relationship between wealth and ecosystem properties: productivity, heterogeneity and stability (1 hour)

6. Methods for the study of genetic diversity. Overview. Description and quantification of genetic variability. Genetic markers and phylogenetic markers: properties and applications. Measures of genetic variation and distance. (1 hour)

7. Main methods for the study of populations, communities and ecosystems. Overview. Inventories of taxonomic diversity. Demographic and behavioral studies. Techniques for the study of interactions between populations and ecosystem processes. (1 hour)

8. Geo-referenced databases, Geographic Information Systems: applications. Commercial software (ArcView versions) and free software (gvSIG). Arcview applications. Arcview data structure. Projects (views, tables, graphs and compositions). Graphic data (themes, projections, scales, legends, symbols, thematic mapping, shape files, shp). Thematic data, -Tables (edition). Spatial analysis. Thematic consultations. Spatial queries (spatial relationships between elements of two themes). Data Analysis. Introduction to digital terrain models (DTM) and raster analysis. (2 hours)

3. BLOCK II-I RISKS AND THREATS TO BIODIVERSITY. CAUSES AND CONSEQUENCES OF BIODIVERSITY LOSS

9. Models of population dynamics for the conservation and management of stocks. Deterministic and random components in population dynamics, environmental stochasticity, and demographic stochasticity. Models of population dynamics, theoretical models and models based on time series. The life cycle and models for structured populations. Exploitation of populations: maximum sustainable yield, fixed quotas, and fixed effort quotas. (2 hours)

10. Population Viability Analysis. Population extinction probability as a function of time. Simulation models and determination of the probability of extinction. Effects of demographic parameters on the rate of population increase: analysis of elasticity and sensitivity. (2 hours)

11. Small populations, genetic drift, and effective population size. Importance of small populations in the conservation of species. Consequences of genetic drift. Effective population size: measurement and factors affecting it. Selection and mutation in small populations. (2 hours)

12. Inbreeding and inbreeding depression. Genealogies and pedigrees. Measures of inbreeding. Inbreeding in small populations. Regular systems of inbreeding. Inbreeding depression and extinction. Inbreeding in natural populations. (2 hours)

4. BLOCK II-II RISKS AND THREATS TO BIODIVERSITY. CAUSES AND CONSEQUENCES OF BIODIVERSITY LOSS

13. Genetic effects of population subdivision. Fragmentation and population structure. Measures of population structure: F statistics. Gene flow. (2 hours)

14. Implications for conservation of the spatial structure of populations. Population differentiation, local adaptation and metapopulation structure. Metapopulation models. Effects of parameters in the frequency of populations and the persistence of the metapopulation. (1 hour)

15. Degradation, destruction, fragmentation, and pollution of ecosystems. Degradation and destruction. Fragmentation, spatial heterogeneity, edge effects and mosaics. Loss of species in the fragmentation processes. Effects of pollution on biodiversity. Sustainable exploitation of ecosystems (2 hours)

16. Invasive alien species. Implications on the diversity and functioning of ecosystems. Characteristics of invasiveness. Pathways. (1 hour)

17. Effects of species loss in the community. Effects of extinction depending on the structure of the food web. Measurements of the stability of the network (vulnerability, resilience, resistance). Analysis of the viability of communities (AVC): fragile networks, secondary extinctions, and key species. Recent examples of chains of extinction. (1 hour)

18. Global change and biodiversity I: Paleo Perspective of climate change on climate changes: gradual and rapid, natural, and man made. Trends in climate change. Changes in the life cycles of populations: modification of their distribution and abundance. Evolutionary impact. (1 hour)

19. Global change and biodiversity II: Effect on species interactions. Synergistic effects of global

changes: changes in biogeochemical cycles and changes in radiation. (1 hour)

5. SECTION III -I- CONSERVATION STRATEGIES

20 Systematics and conservation. Conservation and evolution of species and populations, and management units. Evolutionary significant units (ESUs) and operational conservation units (OCUs). Traceability of individuals: forensic genetics. Hybridization of species. (1 hour)

21 Conservation of species and their variability. In situ conservation: Maintenance Technology genetic variation in managed populations. Translocation, reintroductionreintroduction, and reinforcement of individuals to maintain populations. Support measures for the species in situ, manipulation of the biological community or other measures. (2 hours)

22 Conservation of species and their variability. Ex situ conservation: criteria to be met. Zoos. Botanical Gardens. Vegetative conservation. Conservation in vitro. Banks of diversity: DNA banks, seed banks, preservation of pollen and seeds. Tissue culture. (1 hour)

23 Preservation of microorganisms. Principal methods of preservation. Ex situ conservation: the role of culture collections and services they offer to society. Biological Resource Centres and strategies of information management on microorganisms. (1 hour)

24 Conservation of plant species. Strategies for conservation of flora. Management plans for the conservation of flora. Microreserves. (1 hour)

6. SECTION III-II - CONSERVATION STRATEGIES

25. Conservation of animal species. Management of wildlife in natural ecosystems. Species of conservation interest. Management of game species (1 hour)

26. Actions on invasive species. Strategies for prevention and control of the invasion and its effects. (1 hour)

27. Conservation of habitats and ecosystems. Conservation planning: setting goals. Key elements of the ecosystem approach. Preservation of habitats, its structure and function: maintenance and resilience of ecological processes and key resources. Functional redundancy. Concept of environmental impact assessment and risk assessment. Temporary changes. Management plans. Types of modified landscapes. Conservation in modified landscapes. Adaptive conservation and climate change. Follow-up of conservation measures. (2 hours)

28 Protected and non-protected natural areas: Concept. Types. Criteria for the choice of areas to be protected. Design, size and other characteristics. Reducing edge effects and fragmentation. Integration in the conservation strategy. Gap analysis. Conservation in unprotected areas. (1 hour)

29 Ecological networks. Spatial coherence of ecological networks. Ecological corridors and connectivity: importance for the maintenance of species and communities. The Natura 2000 network in Europe, the

Spanish network of protected areas and other networks. (1 hour)

30 Beyond conservation: basic concepts of ecological restoration. Intervention: types, active measures. Ecological trajectory. Reference ecosystems. Basics of designing a restoration plan. (1 hour)

7. SECTION IV-PRACTICE

The practices of the subject will generally have an integrated perspective, articulated around the testing of the fundamental aspects related to the conservation of biological diversity, at specific organizational levels. The integration will be carried out mainly within the subject itself, but some practices can also be articulated with other subjects of the intensification. Additionally, specific practices will also be carried out that will aim to teach certain aspects with application in Conservation Biology, regardless of their inclusion or not in integrated practices.

In the practices, techniques previously learned in subjects of the Degree in Biology will be used to obtain data necessary to address specific conservation problems. Likewise, techniques not previously practiced will be tested. As a whole, the techniques to be tested in the practices may include:

- Molecular techniques to assess genetic and taxonomic diversity.
- Strategies and tools for assessment and conservation of microbial diversity.
- Non-molecular techniques for determining the taxonomic diversity of higher organisms.
- Techniques for the study of populations, their population dynamics and analysis of their viability.
- Techniques for the study of biological communities, their similarities, and interactions between its components.
- Assessment of the diversity of ecosystems and their characteristics, and the loss and degradation of habitats.
- Geo-referenced databases, Geographic Information Systems.

8. SECCION IV-II PRACTICE

The practical sessions will consist of the following:

Field Practices

Field trips will be made for work related to the theme of the course. By choosing a specific geographical environment, certain aspects of the conservation of biological complexity at different levels of organization will be addressed, covering aspects related to biological and other environmental sciences, including legal aspects and basic ecosociologics and the application of the techniques necessary to do so. These outputs will be coordinated with both practices to be done in the laboratory and those made in the computer room. Short-term field trips (1 day) and other more prolonged (several days) could be made, depending on availability and logistical development. The estimated duration of the field practice is about 26 hours. Attendance at the complete field practices is mandatory in order to be evaluated on the subject.

Labs.

The laboratory practices will aim to test specific techniques and procedures to address specific issues related to conservation of biodiversity, including the study of genetic variability within populations level. The students will work with both samples taken during field practice and those provided by the teacher. The estimated duration of the labs practice is about 6 hours, divided into sessions of 2-3 hours. Attendance at least 80% of laboratory practice sessions is mandatory.

9. SECTION IV-III PRACTICE

Practice in computer lab and problem-solving seminars.

Includes some classroom work before or after the field trips. The estimated duration of computers classroom practices in about 12 hours. Primarily addresses some of the following:

- Microbial Resources Internet catalogs, search engines and other tools.
- Estimates of genetic characteristics of a population or species.
- Population viability analysis.
- GIS - Preliminary study of the area for field trips. Representations.
- GIS - Analysis of data.

Attendance at a minimum of 80% of the hours of practical GIS sessions is mandatory.

Case studies based on desk work.

Students will develop case studies using materials supplied by the teacher or obtained independently. These case studies will be introduced in tutorial groups and should result in works that students will submit in the format specified by the teacher to each of them.

Work practices and application of knowledge acquired and criteria

Some practical work will consist in solving a case study on a specific aspect related to the conservation of a species (geographical and temporal scale appropriate) or an ecosystem, or other issues related to conservation biology. In this work, which will be linked to the practices of the course and conducted by groups, using knowledge and skills gained throughout the course, and must be submitted in the format specified by the teacher. Attendance at a minimum of 80% of the hours of practical GIS sessions is mandatory.

10. SEMINARS

The seminars will include development of specific topics, for the implementation or expansion of its content, and will be taught by specialists or by the students themselves in a study led by the teacher. Attending a minimum number of seminars will be required. The seminars may be scheduled together, when necessary, with other courses of intensification.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	53,00	100
Laboratory practices	30,00	100
Computer classroom practice	11,00	100
Tutorials	3,00	100
Classroom practices	3,00	100
Attendance at events and external activities	2,00	0
Development of group work	20,00	0
Development of individual work	10,00	0
Study and independent work	20,00	0
Readings supplementary material	8,00	0
Preparation of evaluation activities	40,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	15,00	0
Resolution of case studies	15,00	0
TOTAL	**250,00**	

TEACHING METHODOLOGY

The course will be taught by performing different activities and the use of different methodologies, primarily:

- Lectures.
- Practices in the field.
- Practices in the laboratory.
- Practices in computer lab.
- Troubleshooting Classroom
- Seminars
- Group Tutorials.
- Case studies based on desk work.
- Application of practice and acquired knowledge and criteria in a specific work.

The virtual classroom will be used as a tool of communication and storage of work materials, among other possible uses. The specific and thematic bibliography does not fit in the space of this section of the teaching guide, for what is available to students in the "resources" the virtual classroom.

EVALUATION

Objective evidence, consisting of one or more tests which may consist of theoretical issues, practices, and problems: 60 %

Assessment of practical activities from the preparation of papers / reports and / or exhibition of these, including the preparation of seminars and the development of case studies: 40%

The mark will be global in each call, calculated by adding the scores from the previous paragraphs, provided that for each of the parts the rank is at least 4 out of 10. Otherwise the rank of the round will be "failing grade". Failure to pass the subject in first round of the academic year, the qualifications of those parts of the course (from the two outlined in the table above) in which a grade of at least 50% of the score has been obtained will be saved for the second round within the same academic year. In no case will any of these qualifications be kept for the next academic year, except those from the field practices.

To request the advancement of the subject call, students must have completed the compulsory activities indicated in the course guide.

REFERENCES

Basic

- Groom, M. J.; G. K. Meffe, and C. R. Carroll (2006). Principles of Conservation Biology. Third Edition. Sinauer, Sunderland, MA
- Hunter M.L. and J. Gibbs (2007). Fundamentals of Conservation Biology. 3rd edition. Wiley-Blackwell
- Primack, R. B. y J. Ros. (2002). Introducción a la biología de la conservación. Ed. Ariel Ciencia. Barcelona.
- Primack R. B. (2006). Essentials of Conservation Biology, Fourth Edition. Sinauer Sunderland, MA
- Sodhi, N. S. and P. R Ehrlich (2010). Conservation Biology for All. Oxford University Press, Oxford, UK.
- Van Dyke, F. (2008). Conservation Biology: Foundations, Concepts, Applications. Springer, New York.
- Palero, F. y F. González-Candelas (2011). Introducció a la Genètica de la Conservació. Manual Docent UVEG. Aula Virtual.

Additional

- Ver listado en el aula virtual