

**COURSE DATA****Data Subject**

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| Code | 43277 |
| Name | Invasions |
| Cycle | Master's degree |
| ECTS Credits | 3.0 |
| Academic year | 2023 - 2024 |

Study (s)

| Degree | Center | Acad. year | Period |
|---------------------------------------------------------|--------------------------------|-------------------|---------------|
| 2148 - M.D. in Biodiversity: Conservation and Evolution | Faculty of Biological Sciences | 1 | First term |

Subject-matter

| Degree | Subject-matter | Character |
|---------------------------------------------------------|--------------------------------------------------|------------------|
| 2148 - M.D. in Biodiversity: Conservation and Evolution | 13 - Cross-disciplinary optional subject areas 3 | Optional |

Coordination

| Name | Department |
|---------------------------|--------------------------------|
| MESQUITA JOANES, FRANCESC | 275 - Microbiology and Ecology |

SUMMARY

This module of Invasions is optative for the master in Biodiversity: conservation and evolution. It has four-month character and is taught particularly at the speciality of Biodiversity and conservation of ecosystems, but it is open to other specialities. The module comprises both theoretical and applied topics, where we discuss on those aspects in which the knowledge of biological invasions help in managing and sustain the environment. The student must finish the module being able to understand the processes of biological invasions by exotic species and their effects on ecosystems, taking into account different focuses with the aim of preserving species and habitats, not forgetting that conserving habitats is the best way to preserve the biodiversity. The module is distributed in 3 credits, which account for 75 hours of work for the student.



PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

The student must have some prior knowledge of Ecology, Botany, Zoology, Microbiology, Evolution, Biogeography and Biostatistics. They must know how to use spreadsheets and online tools for bibliographic search and acquiring scientific documents.

OUTCOMES

2148 - M.D. in Biodiversity: Conservation and Evolution

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- To acquire basic skills to develop laboratory work in biomedical research.
- Be able to access the information required (databases, scientific articles, etc.) and to interpret and use it sensibly.
- Stimulate the capacity for critical reasoning and for argumentation based on rational criteria.
- Favour intellectual curiosity and encourage responsibility for one's own learning.

LEARNING OUTCOMES

SKILLS TO ACQUIRE

- Get to know the main techniques for obtaining and analysing information for the study of biological invasion processes
- Capacity to detect changes in distribution patterns
- Capacity to recognize the biological traits that facilitate or hamper invasion processes
- Capacity to recognize the traits that make ecosystems more or less prone to biological invasions
- Learn how to evaluate data gathered from nature or literature in order to quantify the invasive capacities of exotic species
- To be able to show and discuss the results from research and management on invasive species
- To know the main phases of the invasion process and their implications for management
- To know the main introduction ways of exotic species and the traits of the most successful species
- To be able to recognize the most widespread invasive species of plants and animals



COMPETENCES AND SOCIAL HABILITIES

- Students must acquire the capacity to work in group, and to search and manage information on EIS to build reports
- Capacity to solve problems associated with the study of EIS
- Capacity to do a critical reading and extract own conclusions from scientific articles and discuss them
- Acknowledge the importance of field work for the early detection of exotic species
- Recognize the effect of anthropogenic impacts, natural disturbances and type of habitat and its biodiversity on the invasibility of communities and ecosystems

DESCRIPTION OF CONTENTS

1. Introduction

Introduction to biological invasions. Terminology, concepts and historical development.

2. The process of invasion: dispersal

Phases of the process of invasion
Dispersal and propagule pressure
The process of dispersal
Non-intentional and intentional introductions
Categorizing introductions.

3. The process of invasion: establishment

Establishment of introduced species.
Traits of successful invasive species.
Darwins naturalization hypothesis
Invasibility and diversity. Invasibility, resources and environmental heterogeneity. Invasibility and physical stress. Invasibility and enemies. Invasibility, facilitation and mutualisms.
Geographical aspects of establishment.

4. The process of invasion: persistence and expansion

Traits for expansion
Genetic effects
Regional expansion
Prediction of the expansion range.

**5. The process of invasion: evolutionary aspects**

Evolutionary changes
Evolution after the establishment
Hybridization
Evolution of native species
Evolutionary diversification

6. Impacts and management of exotic invasive species

Impacts of EIS
Herbivory and predation. Competition. Transmission of pathogens
Species and impacts. Sinergy between impacts
Management: phases and considerations
Management: successes and failures

WORKLOAD

| ACTIVITY | Hours | % To be attended |
|----------------------------------------------|--------------|------------------|
| Theory classes | 20,00 | 100 |
| Seminars | 10,00 | 100 |
| Attendance at events and external activities | 5,00 | 0 |
| Development of individual work | 15,00 | 0 |
| Study and independent work | 10,00 | 0 |
| Readings supplementary material | 10,00 | 0 |
| Preparation of evaluation activities | 5,00 | 0 |
| TOTAL | 75,00 | |

TEACHING METHODOLOGY

Teaching of theoretical aspects will be done by means of masterly classes and discussion between groups or pairs of students. They must read a high quality scientific paper on biological invasions and present a critical discussion of it. Some practical activities of observation and analysis of the distribution of invasive exotic species will be carried out in the field.

EVALUATION

The module will be evaluated by means of a written exam and the presentation of a discussion work. The exam will consist of a series of test questions plus open short questions and will be worth 80% of the total mark. The questions in the exam may refer either to theoretical aspects or to practical ones, either explained or discussed in the class or at the field or related to them. Each student must discuss in a critical way, in a written or oral way, a published scientific work (chosen with the consent of the professor) on



some topic of the module. This work will account for 20% of the final mark. In any case, it is compulsory to pass both parts to allow for compensation of marks. The evaluations corresponding to the first and second attempts will have the same founding. Alternatively to the written exam, and previous consensus with the group of students, the evaluation may be carried out, besides by the critical discussion of an article, by doing various presentations and discussions of cases of invasive exotic species and short texts by the students with the supervision of the professor, so as by participation in class in these activities, which will account for 80% of the final marks.

REFERENCES

Basic

- Davis, M.A. 2009. *Invasion Biology*. Oxford University Press. Oxford, UK

Additional

- Capdevila Argüelles L., A. Iglesias García, J.F. Orueta y B. Zillett. 2006. *Especies Exóticas Invasoras: diagnóstico y bases para la prevención y manejo*. Organismo Autónomo de Parques Nacionales. Ministerio de Medio Ambiente. Madrid, 287 pp.
- Lockwood JL, Hoopes MF, Marchetti MP. 2007. *Invasion Ecology*. Blackwell, Malden, MA.
- Richardson, D.M. (ed.) 2011. *Fifty years of invasion ecology. The legacy of Charles Elton*. Wiley-Blackwell, Oxford.
- Sax, D.F. et al., eds (2005) *Species Invasions: Insights into Ecology, Evolution and Biogeography*, Sinauer.
- Simberloff and M Rejmanek, eds. 2011. *Encyclopedia of Biological Invasions*. University of California Press.
- Vilà, M, F. Valladares, A. Traveset, L. Santamaría & P. Castro (coord.), 2008 *Invasiones biológicas*. Ed. CSIC. Madrid.
- Williamson M (1996) *Biological invasions*. Chapman & Hall, London.
- *También se pueden consultar y utilizar en clase artículos científicos de diferentes fuentes, incluyendo las publicaciones periódicas SCOPE, Diversity and distributions, Biological Invasions, Journal of Biogeography, Ecology y otras.
- Simberloff, D. 2013 *Invasive Species: What Everyone Needs to Know*. OUP.
- Thompson, K. 2014. *Where Do Camels Belong? The story and science of invasive species*. Profile Books.