VNIVERSITAT DE VALÈNCIA

Course Guide
43245 Ecology and evolution of parasite-host relationships

COURSE DATA

Data Subject	
Code	43245
Name	Ecology and evolution of parasite-host relationships
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
2148 - Master's degree in Biodiversity: Conservation and Evolution	Faculty of Biological Sciences	1	First term

Subject-matter

Degree	Subject-matter	Character
2148 - Master's degree in Biodiversity: Conservation and Evolution	4 - Integral aspects of animal diversity	Optional

Coordination

Name	Department
AZNAR AVENDAÑO, FRANCISCO JAVIER	355 - Zoology
BALBUENA DIAZ-PINES, JUAN ANTONIO	355 - Zoology
MONTERO ROYO, FRANCISCO ESTEBAN	355 - Zoology

SUMMARY

"Ecology and evolution of parasite-host relationships" is a subject of the Master: "Biodiversity: Evolution and Conservation", of 3 ECTS credits. This course is justified for several reasons. First, parasitism is the most widespread life strategy in nature, but one of the most neglected in diversity and conservation studies. In addition, parasites exert a great impact on the ecology of their hosts, both from a population and food web point of view. This impact can be especially relevant from a conservation perspective when it affects endangered species. On the other hand, parasites and their hosts are privileged models for the study of evolutionary patterns and processes. Finally, parasites can be used as suitable markers of, inter alia, population structure, behavior and phylogeny of their hosts, and can also be used as tools for biological control. This applied dimension complements very well the theoretical aspects of parasite-host associations.

The subject is developed through an original and personalized research project that will be supervised by the professors of the course. This project covers aspects of both basic and applied research; the interrelation between both areas is mainly articulated around ecological and evolutionary principles, which provides a synthetic and coherent vision of the discipline, especially designed for the future professional in biodiversity and conservation. It is expected that, after taking the course, students will have acquired basic knowledge of parasitology, useful to address multiple problems, both theoretical and applied.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

None.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

2148 - Master's degree 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 make quick and effective decisions in professional or research practice.
- Be able to access the information required (databases, scientific articles, etc.) and to interpret and use it sensibly.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Be able to access to information tools in other areas of knowledge and use them properly.
- Stimulate the capacity for critical reasoning and for argumentation based on rational criteria.
- Favour intellectual curiosity and encourage responsibility for one's own learning.
- Encourage ethical commitment and environmental awareness.
- Be able to communicate and disseminate scientific ideas.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

The student should be able to:

- Use parasitological terminology appropriately.

- Find, identify, fix and conserve metazoan parasites in a parasitological study.

- Conduct basic statistical analysis of parasitological data, recognizing the particularities and problems of this type of studies.

- Interpret parasitological data from an ecological and conservation point of view.

- Plan a basic design of a research work on parasitology.

DESCRIPTION OF CONTENTS

1. Theoretical Foundations: Basic Concepts

In this first block the following basic concepts are reviewed:

Biotic associations: concept of parasite. Extent of parasitism and importance of parasites. Adaptations to parasitism. Types of parasites and hosts. Life cycles: incorporation of hosts and shortening of cycles. Transmission of parasites by free-living stages and predation: adaptations.

Concepts and measures of specificity. Empirical determinants of parasite specificity: contact filter and compatibility. Specificity in the context of biological invasions.

Exploitation of the host. Concept of virulence. Virulence as a strategy. Trade-offs associated with the level of exploitation: the role of transmission. Phenotypic effects of parasitism. Phenotypic manipulation. Increased trophic transmission through phenotypic manipulation.

2. Theoretical foundations: Ecology of parasite-host associations

Ecology of parasite populations. Basic concepts: (1) Hierarchical nature of parasite populations. Infrapopulations, component populations and suprapopulations. (2) Aggregation and its consequences. Measures of aggregation. (3) Density-dependence. Parasite-host population dynamics. Concept of compensatory and additive mortality.

Microhabitat selection. Proximate causes of parasite habitat selection: hosts as a third environment. Ultimate causes of habitat selection: specialization effects, maximization of reproductive opportunities, reinforcement of reproductive barriers, intra- and interspecific competition.

3. Theoretical background: Evolution of parasite-host associations

Basic concepts of coevolution: co-speciation and co-adaptation. Importance of colonization (filters). Methodology applied to coevolutionary studies. Examples.

4. Theoretical foundations: Parasites as biological markers

Parasites as markers: basic principles. Phylogenetic, ethological, population and traceability studies: examples.

5. Development of the research work: Formation of research groups, choice of research topic

Once the contents of the theoretical block have been reviewed, the next session will be devoted to organizing the research groups. The general topics will deal with metazoan parasites (typically, but not only, of vertebrates). These topics will be chosen by groups of students from a set of topics offered by the lecturers, although additional topics may also be proposed by students, and will be accepted as long as they are feasible.

6. Development of the research work: Seminars

This last block includes the presentation of two seminars per research group. In the first seminar, the groups will present the chosen topic and its objectives, and it will be submitted for discussion. In the second (final) seminar, each group will present, in detail, the problem, objectives, methodology, results and discussion of the work done.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	20,00	100
Laboratory practices	10,00	100
Development of group work	35,00	0
Preparation of evaluation activities	10,00	0
TOTAL	**75,00**	

TEACHING METHODOLOGY

The course consists of a first part of theoretical fundamentals, which will be worked through lectures, using exercises to understand concepts that will be solved during the sessions. This block will serve as a brief review of some of the central concepts in parasitology, particularly those that will be used to develop the research project. In a second block, on the elaboration of such a project, the student will tackle an original research question in parasitology and will obtain and analyze the data to answer it. This approach provides a richer management of different ways of learning and problem solving, and a more realistic exposure to their future professional performance.

The organization and follow-up of the research project will be as follows:

- Different teams will be formed depending on the number of students enrolled in the subject. Except for justified exceptions, a minimum of 2 and a maximum of 5 members per group will be accepted.

- Each group will be assigned a supervisor, with whom the original research topic will be discussed and realistic objectives will be set for the time available. Each group will be responsible for obtaining basic bibliography on the chosen topic, which all members will be required to read. In this way the students will become familiar with the subject matter.

- Each group will prepare (with the help of the pertinent bibliography) and present its research project to the rest of the students, in order to let it know and submit it for discussion. The need to explain the project to others will help the members of each group to become aware and clarify what they want to do and why.

- According to the final planning of the work, the members of each group will collect data in the laboratory under the tutor's guidance. However, it is expected that, after an initial learning period, students will be able to work autonomously.

- With the data obtained, statistical analyses will be carried out, if necessary, under the supervision of the tutor, and the implications of the results will be discussed.

- Each group will elaborate a final presentation of 45 minutes, plus 15 minutes for discussion, in which the problem, objectives, methodology, results and discussion of the work done will be presented. All members of the group will participate in the presentation with a similar duration. It will not be necessary to submit a manuscript. In this final meeting each group will present their work, using the format of a scientific congress.

EVALUATION

Given the eminently practical and applied nature of the course, there will be a continuous evaluation.

Theoretical classes:

Attendance and participation will be assessed.

Research work:

The basis of the evaluation in this section is the active involvement of the students in the elaboration of the research project. The minimum required from the point of view of the volume of work will be the following: (1) the elaboration and oral presentation of the two seminars and (2) attendance and participation in data collection.

The evaluation of the research work will be based on the following criteria:

(a) Search and handling of appropriate bibliography.

b) Dedication and effort during the development of the work.

c) Quality of the contribution (in terms of effort made).

d) Ability to synthesize.

e) Capacity to integrate information.

f) Clarity and mastery of discourse in the presentation. (Individual grade).

g) Adequacy of the presentation to the time available.

Relative evaluation of each part:

- Research work and seminars: 75% of the final grade.

- Seminar comprehension test. Attendance to the seminars is compulsory. After the final presentations there will be a brief individual written test in the classroom to evaluate the level of understanding of the seminars presented, including the student's own: 25% of the final grade.

All items must have a score equal to or higher than 5.

REFERENCES

Basic

- Bush, A.O., Fernandez, J.C., Esch, G.W. y Seed, J.R. (2001). Parasitism. The Diversity and Ecology of Animal Parasites. Cambridge University Press, Cambridge.
- Cheng TC (1986) General Parasitology, 3rd ed. Academic Press, New York.
- Cox, F.E.G. (Ed.) (1993). Modern Parasitology, Second Edition, Blackwell Scientific Publications, Oxford.
- Esch GW y Fernández JC (1993) A functional biology of parasitism. Ecological and evolutionary implications. Chapman & Hall, London.
- Poulin, R. (1998). Evolutionary ecology of parasites. Chapman & Hall, Londres, 212 pp.
- Halton DW, Behnke JM y Marshall I (eds) (2001) Practical exercises in parasitology. Cambridge University Press.
- Roberts, L.S. y Janovy, J. Jr. (2005). Foundations of Parasitology, 7th Edition, Wm. C. Brown Publishers, Dubuque.
- Sullivan J.T. (2000) Electronic Atlas of Parasitology. McGraw Hill.

Additional

- Division of Parasitic Diseases. Centers for Disease Control & Prevention. National Center for Infectious Diseases: http://www.dpd.cdc.gov/dpdx/Default.htm
- The American Society of Parasitologists: http://asp.unl.edu/index.php
- Quantitative Parasitology 3.0: http://www.zoologia.hu/qp/qp.html