

Ichthyology

Code: 100847
ECTS Credits: 6

Degree	Type	Year	Semester
2500251 Environmental Biology	OT	4	0

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Other comments on languages

Most of the sessions will be in Catalan. However, some teaching material and some sessions might be in English.

Prerequisites

There are no specific prerequisites, apart from that students have already passed the subjects of Zoology and Extension of Zoology

Objectives and Contextualisation

The objective of this subject is to provide basic training in the knowledge of ichthyology and to illustrate how and why fish are the most diverse group of vertebrates. The adaptation is presented to illustrate how the fishes have exploited a great variety of habitats and niches. In this subject we will enter into the anatomy and morphology of the bony and cartilaginous fish. Likewise, it is intended that the student enter into the basic principles of systematics and evolution, and how they have been used to study the diversity of fish. Another important part of the course is about studying some groups of important Mediterranean and Atlantic fish. This module also covers issues such as genetics, conservation and ecology at a reasonable depth. The ultimate goal is to learn how to acquire and apply this knowledge to a specific project, related to the topic.

Competences

- Adopt an ethical stance.
- Develop a sensibility towards environmental issues.
- Identify organisms and recognise the different levels of biological organisation.
- Integrate knowledge of different organisational levels of organisms in their functioning.
- Obtain, observe, handle, cultivate and conserve specimens.
- Reason critically.
- Recognise and analyse phylogenetic relations.
- Sample, characterise and manipulate populations and communities.

Learning Outcomes

1. Adopt an ethical stance.
2. Collect, determine and conserve specimens and collections of invertebrates and vertebrates.
3. Design and execute samplings of the populations and communities of invertebrates and vertebrates in their habitats.
4. Develop a sensibility towards environmental issues.
5. Interpret and recognise the different states of development of invertebrates and vertebrates.
6. Interpret the evolutionary processes that have led to the diversity of invertebrates and vertebrates.
7. Interpret the origin and functioning of organic structures in the different groups of invertebrates and vertebrates.
8. Reason critically.
9. Recognise the characteristics that distinguish the principal groups of invertebrates and vertebrates.

Content

The course has two main conceptual blocks. The first deals with the aspects of the form of fish, biology (feeding and reproduction) while the second approaches the diversity of these forms, along with aspects of ecology, conservation. The different topics will be addressed as the project progresses.

a) Form

1. Introduction: What is a fish? Taxonomy vs. systematics. Approaches to classification (apomorphies, plesiomorphies,...). Taxonomic characters (anatomical characters, morphometric characters).
2. Skin and scales. Epidermis and scales
3. Skeleton. Skull. Postcranial skeleton: Spinal column and caudal fins, and appendicular skeleton.
4. Internal anatomy. Circulatory system, digestive system, swim bladder, kidney, gonads, nervous system.
5. Locomotion. Shape and movement. Shark movement
6. Feeding. Type of feeding (biting, sucking, chewing, swallowing / swallowing)
7. Life history and reproduction. Cycles of activity and reproductive behavior. Determination, differentiation and maturation. Eggs and sperm. Embryology
8. Development and "life history". Larval development. Juveniles and adults (age and growth).

b) Diversity and ecology

1. The "fish story"
2. Chondrichthyes
3. Primitive fish
4. Teleosts
5. Trophic networks. Fish as predators. Fish as dams. Effects on plants and invertebrates.
6. Interactions between individuals. Social associations (reproduction, aggregation, cooperation)
7. From individuals to populations to communities and ecosystems
8. Zoogeography. Continental waters. Marine waters Invasive species / autochthonous species
9. Adaptations to special habitats. Cold waters (polar regions). Deep water (deep sea). Open water (open sea). Waters of fast currents. Caves
10. Fish genetics. Molecular ecology (population size / genetic structure, hybridization, speciation via zoning (habitat selection). Population genetics. Phylogeography. Conservation genetics
11. Conservation. Loss of biodiversity, extinction. Fishes as bioindicators. Restoration of habitats, breeding in captivity
12. Sampling and tracking techniques. Telemetry and marking (Tagging) and censuses.
13. Animal ethics
14. Statistics applied to ichthyology

Field and laboratory practices are divided into:

Field practice Field sampling

In this practice, it will go to the sea to carry out the prospection and census of interstitial fish as bioindicators, feeding aspects, etc.

Laboratory practice	Necropsy of a fish.	Theoretical-practical practice where the subjects of external anatomy of skin and scales will be taken, and anatomy of soft parts (not skeletal-skull). These parts will be described and will be related to their functionalities.
Laboratory practice	Diversity of common species.	Based on a variety of commonly used species, they will be described, classified and learned to identify. Attention will also be paid to the way and function of certain structures (body shape, mouth, fins) to draw conclusions from their biology.
Laboratory practice	Describe a new species?	In this species we will present some unusual fish (eg deep-sea fish) and we will try to make its description.
Laboratory practice	Practical work.	In this session the practical work proposed in consensus will be developed by the students, in order to solve the question that arose.
Extern visit	Aquarium	We will study in depth the contents of the subject through a visit to the facilities

*Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

Methodology

The methodology used in this subject to achieve the learning process is based on making the student work the information that is available to her/him. The role of the teaching staff is to give you the information or to indicate where you can get it and help it, with tutorials, so that the learning process can be carried out effectively. To achieve this goal, the subject is based on the following activities:

Classroom sessions

Part of the content of the program of the subject will be accessible by students through thematic capsules, documents or videos, which can be accessed at any time. There will be sessions of discussion or debate on specific topics with the whole class group, and most classroom sessions will be work sessions where students will develop the project of the subject, and the teaching staff will be present in-person to guide in the elaboration of this. The sessions will be complemented by the display of animations and videos related to the topics covered in class. Part of the content of the subject will be developed through student learning activities, by solving questions raised by the teaching staff that will be resolved either during the session or at the beginning of the session (when they serve as a review of content or questions of interest to the whole group) or at the end of it as questions for reflection. The TIC material used by teachers will be available on the virtual platform. It is essential that students consult and work on the material and have it accessible during classroom sessions, especially to be able to use it as a support when working and advancing in the development of the project. It is advisable for students to regularly consult the books recommended in the Bibliography section in order to consolidate and clarify, if necessary, the TIC content approved by the teaching staff. With these classroom sessions students acquire the basic knowledge of the subject, which must be complemented by personal study, and apply this knowledge to a practical case, the project of the subject.

Seminars

They will consist of lectures, where we will discuss in groups current issues / transfers previously programmed by the teaching staff. The participation of the students will be valued. The mission of the seminars is to promote critical thinking and awareness in relation to environmental issues.

Field and laboratory practices

Field practices, visits and laboratory will consist of outings to obtain and measure research parameters in the field of ichthyology. The laboratory practices will be aimed at the processing of samples / data and treatment of results of field practice. There will also be different practices where subjects will be given about the anatomical and functional aspects, as well as aspects of diversity.

One of the laboratory practices will be devoted to a practical group work that will consist of generating a question in consensus with the students based on a justified background, and a hypothesis to be resolved through work. This work is a fundamental component of training. The final document will be the creation of a poster in which the experience will be summarized.

During this course, one of the fieldtrips to the sea is coordinated with a fieldtrip from the subject Biology and diversity of non-arthropod invertebrates. The fieldtrip has been coordinated in calendar and destination (Montgrí Natural Park, the Medes Islands and the Baix Ter), in order to encourage students to attend the two subjects. One day in the sea will be devoted to Biology and diversity of non-arthropod invertebrates and the other day at sea in Ichthyology. In the case of taking the two subjects, the stay in Estartit is carried out by the students.

Tutorials

The purpose of these sessions is to solve doubts, to review basic concepts not explained in class and to guide the sources consulted by students. The schedule of the individualized tutorials will be specified with the teaching staff. The tutorials will also be used to track the work of the seminar and to follow the practical work.

The aim of these sessions is to resolve doubts, review basic concepts not explained in class and guide on the sources consulted by students. The schedule of individualized tutorials will be specified with the teaching staff. The tutorials will also be used to monitor the practical final work.

*The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classroom sessions	20	0.8	1, 3, 6, 5, 7, 8, 9, 4
Extern visit	4	0.16	1, 6, 7, 8, 9, 4
Field practice	6	0.24	1, 3, 6, 8, 2, 9, 4
Laboratory practice	16	0.64	1, 3, 6, 5, 7, 8, 2, 9, 4
Seminars	6	0.24	1, 3, 6, 5, 7, 8, 9, 4
Type: Supervised			
Tutorials	6	0.24	1, 6, 5, 7, 8, 9, 4

Type: Autonomous				
Preparation of work, resolution of questions and problems	33	1.32	1, 3, 6, 5, 7, 8, 9, 4	
Self study and self-study work	51	2.04	1, 6, 5, 7, 8, 4	

Assessment

The evaluation of this subject is carried out throughout the course following the following criteria:

Evaluation of the project:

The project will be evaluated in groups in two stages, the first at the initial version (version 1), and the second at the final version. The results of the correction of this first version are communicated orally to the students responsible for the work together with suggestions for improvement. The presentation and reasoning of the project presented during the presentation sessions will also be evaluated.

The grade between the first assessment (version 1) and the second assessment (final version) cannot be differentiated by more than 3 points.

This assessment has an overall weight of 25% (version 1) and 25% (final version) of the final grade. The minimum grade to be able to average with the other evaluations is 4.

Student learning folder:

In this part the knowledge acquired by the student in the subject will be evaluated individually (not only during the classroom sessions, but during all the subject), as well as his/her capacity of analysis and synthesis, and of critical reasoning. It consists of a series of learning items that are made during field and lab practices, and classroom sessions, and that each student accumulates. They will be corrected during the course. In some cases, they will be practicum sheets and in others they may be small assessment tests done during classroom sessions.

The different learning evidences will be averaged. These individual notes have a weight of 25% of the overall grade. The minimum grade to be able to average with the other evaluations is 4.

Evaluation of the practices:

Practices (both field and laboratory) will be evaluated by delivering a group poster once the practices have finished.

This evaluation has a global weight of 25% of the final grade. The minimum grade to be able to average with the other assessments is 4. Attendance at all outings and all laboratory sessions is mandatory to pass the course.

Not evaluable:

Attendance to practical sessions (field trips or laboratory practices) and seminars is mandatory.

The student will be graded as "No Avaluable" if the weighthin of all conducted evaluation activities is less than 67% of the final score.

*Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
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Practical evaluation	25%	2	0.08	1, 3, 6, 5, 8, 2, 9, 4
Project evaluation final version	25%	2	0.08	1, 3, 6, 5, 7, 8, 9, 4
Project evaluation version 1	25%	2	0.08	1, 3, 6, 5, 7, 8, 9, 4
Student learning folder	25%	2	0.08	1, 3, 6, 5, 7, 8, 9, 4

Bibliography

BOND CE (1979) Biology of fishes. Saunders Company, W.B. Philadelphia, 514pp (597 BON)

BONE Q, MARSHALL NB, BLAXTER JHS (1995) Biology of fishes. 2nd Edition, Chapman & Hall, 332pp (597 BON)

CALLIET GM, LORE MS, EBELING AW (1986) Fishes: A field and laboratory manual on their structure, identification, and natural history. Wadsworth Publishing Company, Belmont , 194pp (597 CAL)

HELFMAN G, COLLETTE B, FACEY D (2009) The diversity of fishes. 2nd Edition, Blackwell Science, 528pp (597 HEL)

MOYLE PB, CECH JJ (2000) Fishes: an introduction to Ichthyology. Prentice-Hall, New Jersey, 593pp (597 MOY)

MERCADER LL, LLORIS D, RUCABADO J (2003). Tots els peixos del Mar Català. Diagnòs i claus d'identificació. Ed. Institut d'Estudis Catalans, 350pp.

Websites:

- Animal Diversity Web: <http://animaldiversity.ummz.umich.edu/>
- ARKive, Images of life on Earth: <http://www.arkive.org>
- Biodidac: <http://biodidac.bio.uottawa.ca>
- California Academy of Sciences: <http://www.calacademy.org>
- Comisión Internacional de Nomenclatura Zoológica: <http://www.iczn.org/>
- FishBase: <http://www.fishbase.org>
- Instituto Español de Oceanografía: <http://www.ieo.es>
- Organización de las Naciones Unidas para la Alimentación y la Agricultura: <http://www.fao.org>
- Tree of Life web Project: <http://tolweb.org/tree/>

Virtual teaching has highlighted the importance of being able to have online resources. During these months, publishers have opened up a lot of content, and the digital book-proof platform is also available (50,000 accessible books - <https://mirades.uab.cat/eps/>).

In this link, you will find an infographic prepared by the Library Service to facilitate the location of electronic books: <https://ddd.uab.cat/record/224929>

<http://www.uab.cat/doc/BibliografiaCursDigital>

Software

The software for this subject will depend on the project being carried out. In any case, apart from the basic software, the rest will be free software, such as the R program. You will not be required to purchase any licensed software.