

**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.

**Teachers**

Oriol Rodriguez Romeu

**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

**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 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.

### 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        | Aquàrium                     | 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

A part of the content of the course program will be taught by teachers in the form of master classes. The sessions will be complemented by the visualization of animations and videos related to the topics discussed in class. Also, another part of the content of the subject will be developed through student learning activities, by solving issues raised by the teachers that will be resolved well during the session, or at the beginning of the session ( when they are used to review contents already exposed in previous sessions) or at the end of it as questions of reflection on the matter explained. The material used by the teaching staff (ICT) will be available on the virtual platform. It is recommended that students print this material and take it to the sessions, especially to be able to use it as a support for the work of groupal activities. It is recommended that students regularly consult the books recommended in the Bibliography section in order to consolidate and clarify, if necessary, the contents explained in class. With these classes the student acquires the basic knowledge of the subject that must complement the personal study of the topics explained.

## Seminars

They will consist of supervised work sessions, where they will discuss in groups current issues / transfers previously programmed by the teaching staff. The participation of the students will be valued. There will be an exposition and debate of the practical works on the part of the students in group. The mission of the seminars is to promote the capacity for analysis and synthesis and critical reasoning.

## 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 realization of a poster in which the experience will be summarized and will be presented in class.

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. The first day in the sea will be devoted to Biology and diversity of non-arthropod invertebrates and the second day at sea in Ichthyology. In the case of taking the two subjects, the stay in Estarlit 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 proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

## **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    |

## Assessment

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

### Evaluation of seminars:

For the seminars, work will be evaluated and the critical and reasoned assessment of the different activities proposed in class. Likewise, the exposition and reasoning of the practical work presented during the seminar sessions will also be evaluated.

This evaluation has a global weight of 25% of the final grade.

### Evaluation of the exams:

In these parts, students' knowledge of the subject will be evaluated individually (not only during classroom sessions, but throughout the course), as well as their capacity for analysis and synthesis, and critical reasoning.

### Partial exams:

Two written exams will be compulsory eliminatory subjects, each with a weight of 25% of the overall grade.

### Final exam:

Students who do not pass (minimum mark of 5), either of the two partial exams will be able to recover them to the final exam. This evaluation has a global weight of 50% of the final mark. The minimum mark to be able to measure with the other evaluations is 4.

### Evaluation of the practices:

Practices (both field and laboratory) will be evaluated by delivering a group report/notebook once the practices have finished. This evaluation has a global weight of 25% of the final grade.

### 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 healthauthorities.

## Assessment Activities

| Title                                         | Weighting | Hours | ECTS | Learning Outcomes      |
|-----------------------------------------------|-----------|-------|------|------------------------|
| Partial examination 1 (individual assessment) | 25%       | 2     | 0.08 | 1, 6, 5, 7, 8, 9, 4    |
| Partial examination 2 (individual assessment) | 25%       | 2     | 0.08 | 1, 6, 5, 7, 8, 9, 4    |
| Practical evaluation                          | 25%       | 2     | 0.08 | 1, 3, 8, 2, 9, 4       |
| Seminars evaluation                           | 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. Diagnòstic 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/ebs/>).

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/22492>