

## Biology of Fishes (I002787)

Course size *(nominal values; actual values may depend on programme)*

<b>Credits 4.0</b>	<b>Study time 120 h</b>	<b>Contact hrs</b>	40.0h
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Course offerings in academic year 2022-2023

A (semester 1)	English	Gent
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Lecturers in academic year 2022-2023

Adriaens, Dominique	WE11	lecturer-in-charge
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Offered in the following programmes in 2022-2023

<a href="#">Master of Science in Aquaculture</a>	<b>crdts</b>	<b>offering</b>
	4	A

Teaching languages

English

Keywords

Fish biology (cartilaginous and bony fishes), anatomy, growth, reproduction, ontogeny, adaptation, systematics, evolution

Position of the course

**FISH MORPHOLOGY** The purpose of this course is to focus on topics where knowledge and theory on fish biology are relevant for being applied in aquaculture practice. It is the aim to understand the biology of teleosts, thus providing a crucial knowledge base for developing a scientific approach towards fish culture. A rapidly expanding, world-wide aquaculture industry and the consequent shortcomings of contemporary practices in fisheries management are demanding this type of information. Recent efforts in enhancing larval fish quality require a good knowledge on larval fish biology. To meet these requirements, this part of the course focuses on the anatomy of bony fishes, followed by aspects of larval fish growth as well as ontogeny (both embryonic and postembryonic). The growth and ontogeny is also considered from a functional point of view.

**SYSTEMATICS OF FISHES** The aim is to obtain a good overview on the diversity of fishes, in particular of those groups used in fish culture (marine and freshwater). After a general introduction on systematics and cladistics, an overview is given of the major fish groups and their specific morphological and ecological characters, and evolutionary adaptations (not part of the exam). In addition, elements from other disciplines, especially aquaculture, but also fisheries and molecular biology, ... are discussed. The practical sessions are quite important. The students learn how to identify the major groups of fishes, to comment upon their morphological characters and how to interpret these in the framework of a modern classification of fishes.

Contents

The course "Biology of Fishes" consists of two main parts: (i) fish morphology and (ii) systematics of fishes.

### **I. FISH MORPHOLOGY**

1. Anatomy of bony fishes (with a practical)
2. Concepts of fish growth and development (growth, allometry, ontogeny)
3. Aspects of fish growth (measuring size and age, growth models, growth rates)
4. Aspects of fish development (staging of development, embryonic period, larval period, juvenile period, adult period)
5. Functional implications of ontogenetic changes (differential growth rates of body portions, growth and hydrodynamic implications, ontogeny and feeding).

6. Aspects related to deformities in aquaculture fish, by discussing some papers from specialised literature.

## **II. SYSTEMATICS OF FISHES**

1. Introduction (not part of the exam; necessary to set the scene)
2. Principles of systematics and cladistics (not part of the exam; necessary to set the scene)
3. General introduction to the anatomy and morphology of fishes (not part of the exam; necessary to set the scene)
3. Evolutionary classification of fishes, concentrating on the major taxonomic groups and on economically important taxa. In addition, the highlights of the FAO factsheets for the most important aquaculture finfish species are discussed.
4. Practical exercises on systematic collections

### **Initial competences**

No particular knowledge is needed to start this course. Terms, definitions and exercises are adapted to students with basic notions of biology.

### **Final competences**

- 1 Students understand the basics of fish anatomy
- 2 They are able to perform a dissection and understand the topographical relationship between organs and organ systems
- 3 They understand the functioning of organ systems, and the relevance of it with respect to applied fish culture
- 4 They are able to determine and interpret aspects of fish growth
- 5 They understand the ontogeny of fishes with respect to larval fish quality and crucial phases during ontogeny (for rearing fish)
- 6 They are able to recognize the different ordos of fishes discussed in the course, by external examination
- 7 They have a detailed insight of the worldwide biodiversity of fishes in general and in particular of target species that are used in aquaculture
- 8 They have a broad knowledge of biotic and abiotic factors controlling gametogenesis and spawning of fish
- 9 Students can interpret basic concepts of fish anatomy to phenotypic problems with fish in an aquaculture context (e.g. deformities)

### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

### **Teaching methods**

Practicum, Online lecture, Lecture, Lecture: response lecture

### **Extra information on the teaching methods**

Lectures are given to the whole group in lecture rooms, with projected powerpoint slides as teaching aids. One discussion lecture is organised where some studies published in literature that deal with deformities in aquaculture fish species are being discussed, and where knowledge on fish anatomy is applied in relation to these issues.

Practicals being organised, involve: (1) performing a dissection on bony fishes with some assignments to be performed (students work in groups of two), and (2) studying external morphology of fishes and identifying fish taxa using preserved specimens.

### **Learning materials and price**

Course notes and presentations used during the course can be downloaded from the electronic learning platform. For the practical sessions, an elaborate collection of bony and cartilaginous fishes is at the disposition of the students. Students receive live African catfish for the localization of different endocrine glands and the practice of artificial induction of spawning.

Costs: copies for courses: For systematics of fishes: 7 euro, Didactic DVD and CD are available on student's cost with respect to copy rights.

### **References**

Chief references for the fish systematics part are:

Helfman, G.S., Colette, B. & D.E. Facey. 1997. The diversity of fishes. Blackwell

(Approved)

Science, 528 pp. Nelson, J.S., 2006. Fishes of the World, Wiley & sons, 624 pp.

### Course content-related study coaching

Students are invited to send questions by e-mail, or can ask questions at the end of the lectures.

### Assessment moments

end-of-term and continuous assessment

### Examination methods in case of periodic assessment during the first examination period

Skills test, Oral examination, Written examination with open questions

### Examination methods in case of periodic assessment during the second examination period

Skills test, Oral examination, Written examination with open questions

### Examination methods in case of permanent assessment

Skills test, Written examination with open questions

### Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

### Extra information on the examination methods

For the **non-periodic evaluation**, the students get a list with questions with respect to the dissection they are performing during the practicals. These are evaluated and scored.

For the **periodic evaluation**, the students do an exam of both parts of the course (fish biology and fish systematic):

- **Fish Biology**: the exam involves (1) open question that need to be prepared in a written form, followed by a focused oral exam, (2) statement that is given and of which the students must provide argumentations (in written form only) why they think the statements are correct, wrong or both, and (3) terminologies for which a definition must be given.

- **Fish systematic**: the exam involves (1) open question that need to be prepared in a written form, followed by a focused oral exam, (2) statement that is given and of which the students must provide argumentations (in written form only) why they think the statements are correct, wrong or both, and (3) terminologies for which a definition must be given. Additionally, (4) a skill test where students need to identify some characters on some fish specimens provided and determine the taxa to which it belongs.

### Calculation of the examination mark

Components included in the final score are:

**1) Fish biology** (partim Adriaens): practical on fish dissection (non-periodic, 1/6 of score) and score on final exam (periodic, 5/6 of score)

**2) Fish systematic** (partim Snoeks): score on final exam (periodic)

The final score is based on the average of the scores on each of the parts, but can deviate from the mathematical average in case one of the two parts shows substantial shortcomings.

*Students who are legitimately absent during the practicals need to make up the relevant exercises at a different time. Unjustified absence in the practical gives rise to a total maximum score (theory + practical exercises) of 9/20, irrespective of the score for the theoretical part.*