GHENT UNIVERSITY

Course Specifications

From the academic year 2021-2022 up to and including the academic year

Physiology of Aquaculture Species (I002880)

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

Credits 8.0 **Study time 200 h** **Contact hrs** 50.0h

Course offerings in academic year 2022-2023

A (semester 1) English Gent

Lecturers in academic year 2022-2023

Navarro, Isabel	BARCELO1	lecturer-in-charge
Blasco, Josefina	BARCELO1	co-lecturer
Capilla, Encarnación	BARCELO1	co-lecturer
Garcia de la Serrana, Daniel	BARCELO1	co-lecturer
Garcia-Meilán, Irene	BARCELO1	co-lecturer
Gutiérrez Fruitos, Joaquim	BARCELO1	co-lecturer
Ibarz, Antoni	BARCELO1	co-lecturer
Martin-Pérez, Miguel	BARCELO1	co-lecturer

Offered in the following programmes in 2022-2023	**crdts**	**offering**
International Master of Science in Health Management in Aquaculture	8	A

Teaching languages

English

Keywords

Fish nutrition, energetics, metabolism, digestibility, dietary requirements, fish oil and fishmeal replacement, food intake control, aquaculture invertebrate reproduction, fish reproduction, hypothalamus- pituitary- gonad axis, spawning induction, sex control, environmental regulation, gamete quality, fish growth, larval development, endocrine regulation of growth, muscle growth and myogenesis, hyperplasic and hypertrophic growth, skeletal malformations, flesh organoleptic traits.

Position of the course

This course aims at introducing into the physiology of fish and invertebrate species relevant for aquaculture, assessing the fundamentals of nutrition, reproduction, and growth, and how can be applied to a sustainable aquaculture development.

Contents

1. Fish nutrition and health

- Food and nutrition. Metabolic rate. Energy balance and its components.
- Gastrointestinal tract: anatomy and physiology. Digestion and assimilation. Antinutritional factors.
- Effects of nutrition on fish health.
- Protein metabolism: synthesis and degradation. Dietary protein quality, digestibility and requirements.
- Carbohydrate metabolism: uptake, metabolization, and dietary protein-saving effect.
- Lipid metabolism: transport and deposition. Antioxidants and oxidative stress.
- Endocrine regulation of metabolism and control of food intake.
- Manufacture of compound feed in fish farming: bases of the formulation.

2. Reproduction of aquatic invertebrates and fish

- Reproductive strategies. Gametogenesis: oogenesis and spermatogenesis.

- Reproduction in invertebrate species relevant for aquaculture.
- Endocrine regulation of fish reproduction: hypothalamic, pituitary and gonadal hormones.
- Hormonal manipulation of reproduction: spawning induction, sex control and sterility induction.
- Gamete quality: techniques to determine the quality and cryopreservation processes.
- Reproduction in fish, control by environmental factors and effects on health.

3.Fish growth and skeletal malformations
- Stages of growth in fish. Embryonic and larval development: hatching and organogenesis. Larval growth.
- Endocrine regulation of somatic growth: Growth hormone and factors, thyroid hormones, and other hormones.
- Fish muscle and skeletal characteristics; development and growth. Hyperplasic and hypertrophic growth.
- Skeletal malformations.
- Musculoskeletal interactions for proper growth and environmental effects.
- Fish flesh quality. Main techniques, reference parameters and quality markers.

Initial competences

General biology, general physiology, zoology

Final competences

1 *Choose the appropriate nutritional and feeding parameters and optimal diets to maintain fish health and to obtain a high quality product in a sustainable way*
2 *Identify the reproductive strategies in fish and aquaculture invertebrates, and know the role of the environment on reproduction and its endocrine regulation, to asses an effective manipulation of the reproductive cycles in those species*
3 *Know how to apply the physiological bases of the development and growth of fish to obtain an optimal growth and good quality of the flesh, maintaining animal welfare*

Conditions for credit contract

This course unit cannot be taken via a credit contract

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Practicum, Demonstration, Group work, Guided self-study, Seminar, Lecture, Project, Seminar: coached exercises, Seminar: practical pc room classes

Learning materials and price

syllabus

References

-Boglione, C., Gavaia, P.Koumoundouros, G., Gisbert, E., Moren, M., Fontagne, S. Witten, P. E. (2013). Skeletal anomalies in reared European fish larvae and juveniles. Part 1: normal and anomalous skeletogenic processes. Reviews in Aquaculture 5 (Suppl. 1), S99–S120
-Boglione, C., Gisbert, E., Gavaia, P, Witten, P.E., M. Fontagne, S., Koumoundouros, G. (2013). Skeletal anomalies in reared European fish larvae and juveniles. Part 2: main typologies, occurrences and causative factors. Reviews in Aquaculture 5 (Suppl. 1), S121–S167.
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-Devlin, R.H., Nagahama, Y. (2002). Sex determination and sex differentiation in fish: an overview of genetic, physiological, and environmental influences Review article. Aquaculture 208, 191–364.
-Devlin, R.H., Sakhrani, D., Tymchuk, W.E., Rise, M.L., and Goh, B. (2009). Domestication and growth hormone transgenesis cause similar changes in gene expression in coho salmon (Oncorhynchus kisutch). PNAS 106: 3047–3052.

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Johnston, I.A. (2012). Fast skeletal muscle transcriptome of the Gilthead sea bream (Sparus aurata) determined by next generation sequencing. BMC Genomics. 13(1):181.
-Grosell, M., Farrell, A.P., Brauenr, C.J. (2011). The multifunctional gut of fish. Fish Physiology 30: 1-448
-González-Kother, P., Oliva, M.E., Tanguy, A., Moraga, D. (2020). A review of the potential genes implicated in follicular atresia in teleost fish. Mar Genomics 50: 100704.
-Herrera, M., Mancera, J.M., Costas, B. (2019). The use of dietary additives in fish stress mitigation: comparative endocrine and physiological response. Frontiers in endocrinology 10: 1-22
-Johnston, I. Fish Physiology, XVIII. Muscle Development and Growth. Ed. Ian Johnston, William Hoar, Anthony Farrell, Academic Press 2001.
-Kamalam, B.S., Medale, F., Panserat, S. (2016). Utilisation of dietary carbohydrates in farmed fishes: New insights on influencing factors, biological limitations and future strategies. Aquaculture 467: 3-27.
-Nakagawa, H., Sato, M. and Gatlin, D. M (editors). Dietary supplements for the health and quality of cultured fish. CAB International (2007)
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-Peter, R.E., and Yu, K.L. (1997). Neuroendocrine regulation of ovulation in fishes: basic and applied aspects Reviews in Fish Biology and Fisheries 7, 173–197.
-Shadwinck, R.E. and Lauder, G.V. Fish Physiology, XXIII. Fish Biomechanics. Academic Press, 2006
-Turchini, G.M. Ng, W.-K., Tocher, D.(editors). (2011). Fish oil replacement and alternative lipid sources in aquaculture feeds, CRC Press.
-Vélez, E.J., Lutfi, E., Azizi, Sh., Perelló, M., Salmerón, C., Riera-Codina,M., Ibarz, A., J Fernández-Borràs, J., Blasco, J., Capilla, E., Navarro, I., Gutiérrez, J. (2017). Understanding fish muscle growth regulation to optimize aquaculture production. Aquaculture, 467, 28-40.
-Zohar, Y., Muñoz-Cueto, J.A., Elizur, A., Kah, O. (2010). Neuroendocrinology of reproduction in teleost fish. Gen Comp Endocrinol. 165:438-55.

Course content-related study coaching

Teacher available for student counselling

Assessment moments

end-of-term and continuous assessment

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

Written examination, Oral examination, Written examination with multiple choice questions, Written examination with open questions

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

Report, Written examination, Oral examination

Examination methods in case of permanent assessment

Simulation, Report, Written examination, Participation, Portfolio, Written examination with multiple choice questions, Written examination with open questions

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Calculation of the examination mark

Exam 30%.; Case report and portfolio 20%; Oral presentation 50%
Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.