

**ACADEMIC YEAR 2024/2025**

<b>General information</b>	
Name of the integrated course	<b>ANATOMY AND PHYSIOLOGY OF FARMED MARINE SPECIES</b>
Integrated teaching modules	<b>Anatomy and morphogenesis of farmed fish; Physiology and endocrinology of aquatic animals.</b>
Degree course	Science of Marine Productions and Resources
Academic Year	I
European Credit Transfer and Accumulation System (ECTS)	12 (ECTS lessons: 10; ECTS exe/lab/tutor: 2)
Language	Italian
Period of teaching	II semester
Attendance	Optional

<b>Teachers</b>	
Name and Surname	Aldo Corriero; Serenella d'Ingeo
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Telephone	+390805713907 (Aldo Corriero); +39 080 0805713779 (Serenella D'Ingeo)
Department and address	Taranto presso Ex II Facoltà di Scienze MM.FF.NN, Via Alcide de Gasperi, (Quartiere Paolo VI) - 74123 Taranto
Virtual headquarters	Microsoft Teams platform (Teams Code: ecv7fud)
Tutoring (time and day)	Monday and Tuesday, 15.00-17.00, on appointment to be agreed by email

<b>Syllabus</b>	
<b>Learning Objectives</b>	The Anatomy and Morphogenesis of Farmed Fish Species course aims to provide a general knowledge of the anatomy and morphogenesis of farmed fish species and the major developmental abnormalities found in farmed fish. The Physiology and Endocrinology of Aquatic Animals course aims to provide an in-depth and up-to-date knowledge of the mechanisms of function of the organs and systems of marine aquatic animals. Students will also learn the basics of endocrinology and understand the physiological mechanisms underlying intercellular communication and the control of marine organism activity by chemical messengers. The study will be of a comparative nature and species differences will be highlighted in accordance with the educational objectives of the programme.
<b>Course prerequisites</b>	Students must have passed the examinations of "General Biology and Zoology" and "Biochemistry".
Contents of the teaching module: <b>Anatomy and morphogenesis of farmed fish;</b>  <i>Teacher:</i> <b>Aldo Corriero</b>  <i>Lectures</i> <b>ECTS: 5</b>  <b>Hours: 40</b>	<b>Histology</b> - Epithelial tissues. Connective tissue proper. Specialised connective tissues. Muscle tissues. Nervous tissue. <b>Anatomy</b> – Locomotor system. Digestive system. Respiratory system. Swim bladder. Integumentary system. Excretory system. Heart and circulatory system. Lymphatic system. Reproductive system. Endocrine system. Nervous system. Sense organs. <b>Developmental biology</b> – Egg. Fertilisation. Cleavage. Gastrulation. Organogenesis. Hatching. Larval phase. Post—larval phase. Skeletal and swim bladder anomalies.



<b>Practical activities</b> <b>ECTS: 1</b> <b>Hours: 10</b>	Use of the light microscope and observation of histological preparations. Anatomical dissections of farmed fish. Observation of original anatomical preparations of malformed fry.
Contents of the teaching module: <b>Physiology and endocrinology of aquatic animals</b>  <i>Teachers:</i> <b>Serenella D'Ingeo</b>  <i>Lectures</i> <b>ECTS: 5</b> <b>Hours: 40</b>	Sense organs: sight, hearing, touch and smell, orientation systems and adaptations to marine life. Osmoregulation. Movement in water, floating and swimming. Aquatic breathing. Blood and cardio-circulatory system in marine vertebrates and invertebrates. Kidneys and excretory system. Digestion. Species differences: bony and cartilaginous fish, bivalve molluscs, cephalopods, crustaceans, echinoderms. The endocrine system. Hypothalamus and pituitary, urophysis, epiphysis, thyroid and parathyroids, pancreas, interrenal tissue and adrenal glands. Gonads and reproduction. Regulation of body temperature, species-specific adaptations.
<b>Practical activities for the integrated course</b> <b>ECTS: 1</b> <b>Hours: 10</b>	Adaptations of animals to marine life. Species differences in aquatic respiration and osmoregulation.
<b>Biosafety rules</b>	Access to laboratories will be allowed only to students wearing protective clothing (disposable coats and gloves) and that have read the biosafety manual.
<b>Material for the personal study</b>	
<b>Books and bibliography</b>	<ul style="list-style-type: none"> <li>• T. ZAVANELLA, R. CARDANI, Manuale di Anatomia dei Vertebrati, Antonio Delfino Editore, Roma, 2008</li> <li>• M. DOAA, M. MOKHTAR, From Cells to Organs, Apple Academic Press</li> <li>• E. De LUCA, Embriologia dei Cordati, Casa editrice Ambrosiana</li> <li>• A. POLI, E. FABBRI. Fisiologia degli animali marini, Edises</li> </ul>
<b>Additional materials</b>	Lecture ppt files and scientific articles will be provided. Students may use alternative textbooks.

<b>Work schedule</b>			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
<b>Hours</b>			
<b>300</b>	<b>80</b>	<b>20</b>	<b>200</b>
<b>ECTS</b>			
<b>12</b>	<b>10</b>	<b>2</b>	
<b>Teaching strategy</b>		Theoretical lectures will take place in multimedia-equipped classrooms using PowerPoint presentations. Students will be provided with scientific articles to supplement the recommended textbooks. Practical exercises will take place in teaching laboratories equipped with microscopes. Histological and whole-body stained preparations of normal and malformed specimens at different stages of	

	development will be observed during the exercises. Anatomical dissections of fish from commercial fish farms will be performed. Practical lectures on adaptations of animals to marine life, aquatic respiration and osmoregulation.
<b>Expected learning outcomes</b>	
<b>Knowledge and understanding on:</b>	<ul style="list-style-type: none"> <li>○ The course Anatomy and Morphogenesis of Farmed Fish will provide basic knowledge of fish histology and anatomy, morphogenesis and major developmental abnormalities in farmed fish.</li> <li>○ The course of Physiology and Endocrinology of Aquatic Animals will enable students to acquire knowledge and understanding of the mechanisms of function of the organs and systems of marine aquatic animals. Students will also acquire basic knowledge of endocrinology and understand that intercellular communication is regulated by the nervous and endocrine systems. By the end of the course, students will be able to functionally relate the various endocrine glands and systems.</li> </ul>
<b>Applying knowledge and understanding on:</b>	<ul style="list-style-type: none"> <li>○ Ability to observe histological sections from biological fish samples and identify tissues.</li> <li>○ Identify embryonic stages and major developmental abnormalities of industrial relevance.</li> <li>○ Communicate effectively using language appropriate to the target audience.</li> <li>○ Assess the physical condition, welfare and nutritional status of an animal.</li> <li>○ Assess and manage pain.</li> </ul>
<b>Soft skills</b>	<ul style="list-style-type: none"> <li>• <i>Making informed judgments and choices</i> At the end of the course, the student will be able to: <ul style="list-style-type: none"> <li>○ identify and correctly describe the tissues and organs of farmed fish</li> <li>○ identify embryonic stages</li> <li>○ recognise the main developmental abnormalities of industrial interest</li> <li>○ evaluate the mechanisms of function of organs and apparatus of marine animals.</li> </ul> </li> <li>• <i>Communicating knowledge and understanding</i> Students will master the terminology of morpho-functional sciences. To achieve this goal, students will be asked to actively intervene during exercises and flipped classroom sessions.</li> <li>• <i>Capacities to continue learning</i> During the practical lectures, students will independently develop their knowledge of the topics covered in group study sessions led by the lecturer. This will enable them to develop their knowledge of the biological structures and functions of the species covered in the course.</li> </ul>
<b>Assessment and feedback</b>	
Methods of assessment	The examination is taken at the end of the course by students in good standing. Knowledge will be tested by means of in progress (optional) tests and a concluding oral exam. The acquisition of competences will be assessed by an oral examination covering the topics of the theoretical lectures and practical activities. Knowledge of the course topics, language skills and the ability to critically describe the relationships between morphology and function of the biological structures studied will be assessed.

Evaluation criteria	<ul style="list-style-type: none"> <li>• <i>Knowledge and understanding</i> <ul style="list-style-type: none"> <li>○ Ability to discuss basic and fundamental concepts</li> <li>○ Ability to analyse the principles of organ and apparatus function.</li> <li>○ Ability to formulate critical hypotheses about the causes and factors involved in the mechanisms of action of the organs and apparatus of marine aquatic animals.</li> </ul> </li> <li>• <i>Applying knowledge and understanding</i> <ul style="list-style-type: none"> <li>○ Ability to identify fish tissues and organs.</li> <li>○ Ability to identify embryonic, larval and post-larval stages of development.</li> <li>○ Ability to identify major developmental abnormalities encountered during rearing.</li> <li>○ Knowledge of methods for assessing physiological parameters of marine aquatic species.</li> </ul> </li> <li>• <i>Autonomy of judgement</i> <ul style="list-style-type: none"> <li>○ Ability to critically engage with programme topics.</li> <li>○ Formulate critical hypotheses about the causes and factors involved in the functioning of the organs and systems of marine aquatic animals.</li> </ul> </li> <li>• <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> <li>○ Knowledge and fluency in correct scientific terminology.</li> <li>○ Ability to discuss critically and independently the topics covered in the programme.</li> </ul> </li> <li>• <i>Capacity to continue learning</i> <ul style="list-style-type: none"> <li>○ Ability to correctly set up the description of programme topics not covered during the course.</li> </ul> </li> </ul>
Criteria for assessment and attribution of the final mark	<p>The assessment will be carried out by means of optional tests and an oral interview to determine the level of knowledge of the proposed topics. The final grade is the result of the combined assessment of the test(s) relating to the two subjects of the course. The final grade, expressed in thirtieths, will be passed if it is equal to or higher than 18 and will take into account not only the completeness of the answers, but also the correct use of scientific terminology, communication skills, clarity of exposition, disciplinary competence and the level of in-depth study.</p>
<b>Additional information</b>	