



UNIVERSITÀ
DEGLI STUDI DELLA
TUSCIA



Università degli Studi della Tuscia

Tuscia University (UNITUS) is a multidisciplinary public university founded in 1979 in Viterbo. With six departments (three of them ranked as “excellent” by the Italian Ministry of Research and University), eight interdepartmental and even interuniversity centres, UNITUS offers advanced facilities for cutting-edge research, besides teaching activities.

UNITUS has a long experience in the development and management of industrial research and development projects at both national and international level and has ongoing bilateral agreements with partners across the world. Although being an excellence centre for various disciplines in both Italy and Europe, UNITUS is highly committed in local development and in the production of innovative processes involving both academic research and small to medium-sized enterprises (SMEs). Among the main research scientific fields, UNITUS has always paid attention to the environment (marine, freshwater and terrestrial), climate change, green technologies, new materials, and the circular economy.

The Department of Ecological and Biological Sciences (DEB-UNITUS) has developed research and teaching competences oriented to marine environment. Some labs dedicated to molecular ecology are in the headquarters of Viterbo, but the main infrastructures are hosted at CISMAR, the Ichthyogenic Experimental Marine Centre, located within the Regional Natural Reserve of the Tarquinia Salterns (Northern Latium). Here are the facilities for experimental aquaculture (tanks, labs and instrumentation) and the labs of molecular parasitology and environmental DNA.

Research groups are specialized in the study of marine biodiversity at all organization levels (genes, species, communities and ecosystems), with multidisciplinary and integrated methodologies applied to sustainable aquaculture and seafood under a “one-health” approach. Within this frame, molecular ecology methods are used to investigate marine biodiversity as a resource for fishery, ecosystem functioning and experimental aquaculture, while behavioural and ecophysiological research support the set-up of innovative aquaculture techniques able to produce “high quality” specimens for restocking and guidelines on crustacean and cephalopod welfare. Parasitological and microbiological studies are aimed at finding the relationships between the state of marine ecosystems and parasites/pathogens transmission along the food webs, including humans through seafood.



ECOSYSTEM ACCESS

• COASTAL VESSELS

The Department of Ecological and Biological Sciences of Tuscia University oversees a fleet of specialized research vessels dedicated to advancing scientific exploration in the field of marine ecology. Vessels are equipped with cutting-edge facilities, operated by experienced crews, and feature advanced instrumentation tailored for rigorous scientific investigations along diverse coastal areas. Spanning from the Tuscan to the Pontine Archipelago and including the Lazio coastal strip, these vessels support a wide range of scientific endeavours, from collecting biological samples to providing surface support for underwater activities.

Their technical features are complemented by their function as interdisciplinary platforms, providing researchers with a unique vantage point to explore and understand the ecological processes within Central Tyrrhenian coastal ecosystems. A diverse array of vessels is ready to facilitate a broad spectrum of scientific activities.

- **6-Meter Vessel (28HP):** This 6-meter gozzo, boasting 28 horsepower, is equipped with a hydraulic winch featuring a maximum load capacity of 150 kg. Its operational range extends up to 10 miles from the harbour and within 6 miles from the coast. This vessel can accommodate a crew of four operators.
- **8-Meter Vessel (115HP):** fitted with a hydraulic winch capable of handling a maximum load of 250 kg, this vessel's operational reach extends up to 20 miles from the port city of Civitavecchia (within 6 miles from the coast). With a larger capacity, this vessel allows for the embarkation of up to eight operators and plays a central role in deploying nets and other specialized scientific apparatus. A 100-liter open-circuit seawater tank on board allows for the transportation of live animals.
- **6-Meter Dinghy (100+5HP):** The fleet is complemented by a 6-meter dinghy propelled by a 100+5 horsepower engine. This versatile vessel has an operational range spanning from San Felice Circeo to Argentario, covering the entire Pontine and Tuscan Archipelagos, featuring an operational range extending up to twelve nautical miles from the coastline. With the capability to embark a crew of four, it assumes a critical role, functioning as surface support for underwater activities and playing a key role in the collection of environmental DNA and biological samples across a broad range of operational areas." The Genomic and Molecular laboratory specializes in the investigation of marine organisms, with a specific emphasis on eukaryotes and host-parasite interactions.



RESEARCH & TECHNOLOGY PLATFORMS

- GEM LAB (GENOMIC AND MOLECULAR LABORATORY)

The centre employs a combination of standard and advanced molecular techniques to comprehensively explore the genetic intricacies of marine organisms and delves into the dynamics of host-parasite interactions.

DNA barcoding is a prominent method used by the centre. This technique involves the analysis of short, standardized DNA sequences to identify and classify species. In the context of marine organisms, DNA barcoding serves as a powerful tool for precise species identification, facilitating the exploration of biodiversity and aiding in the recognition of various prokaryotic and eukaryotic entities.

Furthermore, the advanced microscopy capabilities of MICRO LABs (see the next paragraph) complement this approach, providing a comprehensive understanding through morphological analyses. This integrated approach enables a thorough examination of both phenotype and genotype, contributing to a holistic and detailed exploration of marine organisms.

The centre also places a key focus on environmental DNA (eDNA) analysis. This approach involves extracting and analysing genetic material directly from environmental samples, such as seawater. eDNA provides a non-invasive means to study the genetic composition of diverse marine organisms, shedding light on their presence and dynamics in the ecosystem. Through the application of eDNA, the centre contributes to a more comprehensive understanding of marine biodiversity and the intricate relationships between different organisms.

Sequencing employs advanced nanopore methods, such as the MinION platform, for rapid and efficient DNA sequencing. This cutting-edge technology enhances the centre's capabilities for quick and accurate analysis, further advancing their research in marine genomics.

Furthermore, the centre offers real-time analysis of DNA and RNA, with a particular emphasis on gene expression studies and spectrofluorometry analysis of enzymes and proteins. These capabilities enable a more thorough investigation into the molecular mechanisms that underlie the behaviour and adaptation of marine organisms also subjected to various natural and/or anthropogenic stressors.

Overall, the Molecular and Genomic Analysis Centre integrates a diverse array of molecular techniques to advance our understanding of the genetic complexities within marine ecosystems.



MICROSCOPY LABORATORY SERVICES (MICRO LABS)

The microscopy laboratory services feature cutting-edge imaging capabilities with a pair of top-tier optical microscopes from Zeiss and Leica. The inclusion of fluorescence capabilities in both Leica microscopes enhances our capacity for advanced research, particularly in the interdisciplinary study of marine ecosystems and their associated organisms. The microscopy lab acts also as a valuable complement to molecular studies, enabling the analysis of phenotypes associated with specific genotypes or gene expression responses.



