UM5MRM29	MOLECULAR ECOLOGY OF MARINE MICROORGANISMS	
6 ECTS	*Keywords*	microeukaryotes/protists, bacteria, virus, diversity, adaptation, interaction, culture, technological approaches, physiology.
M2	*Managers*	Christophe SIX, Nathalie SIMON (AD2M, Roscoff)
Roscoff	*Professors*	LBBM Banyuls, researchers and technical staff from Roscoff
	Tracks	Biodiversity and conservation of marine ecosystems

Description

Format

Teaching

The EcoMicro course includes about 20 hours of lectures and 40 hours of practical and project-based work. The course is structured into three workshops conducted simultaneously over three weeks: 1) a hands-on laboratory research workshop addressing a current scientific question, 2) A collaborative workshop aimed at building research strategies and tools, including "omics" approaches, to dig into microbial interactions, and 3) an integrative biology workshop focusing on marine heterotrophic and phototrophic bacteria as model organisms. The module is fully supported by the Moodle interface, providing access to all course materials, multimedia resources, and preparatory learning modules for evaluation.

Evaluation

Examination is divided as follows: 50% based on a final written exam and 50% on activities evaluated during the module (report and/or oral presentation).

Summary

Marine microorganisms account for almost half of the marine carbon biomass. They play a central role in regulating energy and nutrient flows within marine ecosystems. They include a myriad of phototrophic, mixotrophic and heterotrophic microeukaryotes and prokaryotes (bacteria, and archaea), and also marine viruses, whose importance has only recently been recognized. The remarkable taxonomic and functional diversity of marine microorganisms enable them to colonize all marine environments and rapidly adapt to environmental changes.

Marine microorganisms have long been overlooked due to the challenges of observing them in their natural environment and cultivating them in the laboratory. However, they are pivotal to the ecological balance of our planet, and their adaptive capacities in the face of environmental disturbances make them a crucial subject of study. The EcoMicro module highlights recent scientific advances in understanding the ecology of marine microorganisms on a global scale. By leveraging cutting-edge technologies used in the field and the laboratory, this course opens the door to a largely unexplored universe. The students will uncover the taxonomic richness of marine microorganisms, the diversity of interactions among organisms, and their remarkable adaptive capabilities developed over the course of evolution.

Learning objectives

By the end of the EcoMicro module, students will be able to:

1. Propose structured strategies and relevant tools for the study of marine microorganisms
2. Record experimental work in laboratory notebook
3. Implement techniques for the isolation, cultivation, and characterization of marine microorganisms
4. Analyse and critically evaluate data obtained from "omics" technologies
5. Highlight the connections between the diversity, adaptation, and evolution of marine

microorganisms

Prerequisites

The prerequisites for the EcoMicro module are a basic undergraduate level in Life Sciences. A simple preparatory module is provided one week before the start of the course, allowing students to review key concepts in cellular biology relevant to marine microbiology.

Bibliography

N/A

Organisation details

Lectures

1. Diversity and characteristics of marine protists
2. Marine viruses-phytoplankton interactions in marine environments
3. Planktonic photosymbioses in marine ecosystems
4. Molecular adaptations of marine picocyanobacteria to the World Ocean
5. Diversity and interactions among (photo)heterotrophic bacteria

Tutorials and practical sessions

1. Methods for studying marine microorganisms in the laboratory: isolation, culture, flow cytometry, microbial growth analysis.
2. Technological approaches applied to marine microorganism ecology and physiology: optical methods, (meta)transcriptomics, (meta)genomics, proteomics, metabolomics, phylogenetics. Visit to technology platforms.
3. Understanding the scientific research system: the classical scientific approach, laboratory notebooks, scientific document writing methods, careers in scientific research, functioning of the international scientific publishing system.

Note: This document is for informational purposes. The details of the content and format of the courses and evaluations may change from year to year.