

NeuroMITilus
Unraveling the role of mitochondria in coping with hypoxia/reoxygenation stress
in *Mytilus galloprovincialis* nervous system

Director of Studies: Dr. Serena Mirra

Department: Biology and Evolution of Marine Organisms

Seat: Naples

Abstract

Mussels are ecologically dominant in the intertidal zones and have successfully adapted to fluctuations in oxygen (O₂) availability, due to both the intrinsic characteristics of the environment and the deoxygenation of aquatic habitats caused by eutrophication and warming. Facing **hypoxia-reoxygenation** (H/R) stress requires exquisite homeostatic responses, especially in tissue with a high O₂ and metabolic demand, such as the **nervous system** (NS). In hypoxia-sensitive organisms such as mammals, **mitochondria** are the hub of H/R-induced neural damage, since O₂ deficiency impairs ATP production, whereas a surge of O₂ causes an excessive production of toxic O₂ reactive species (ROS).

The main objective of *NeuroMITilus* is to expand the current concept of tolerance to H/R stress by elucidating the resilience mechanisms specific of the NS in the Mediterranean mussel, ***Mytilus galloprovincialis* (Mg)**, with a particular focus on **mitochondrial homeostasis** (dynamics, function, bioenergetics), autophagy, cell death and inflammatory responses. Molecular dissection of the pathways underlying these resilience strategies will allow us to identify specific mechanisms needed to face the H/R stress.

The cutting-edge experimental approaches planned in the project - including molecular and cellular biology techniques, “Omics” (Transcriptome and miRNOME), biochemical and computational analyses, imaging, and physiology techniques - will make possible to reach new knowledge on the **molecular mechanisms of environmental adaptation** in mussel NS. The latter has also a strong biomedical impact: hypoxia and hypoxia-reperfusion occur in medical conditions in humans, such as stroke. Therefore, the novel data on hypoxia-tolerant molluscs will bring to light the evolutionarily tested solutions to prevent or mitigate the damage associated with H/R.