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

Director of Studies: Serena Mirra

Department Biology and Evolution of Marine Organisms

Seat:

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”, 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.