

UNIVERSITÀ DEGLI STUDI DI ROMA "TOR VERGATA"



DOTTORATO DI RICERCA IN BIOLOGIA EVOLUZIONISTICA ED ECOLOGIA

PHD PROGRAM IN ECOLOGY AND EVOLUTIONARY BIOLOGY



**THE MICROBIAL EPIPHYTIC COMMUNITIES OF SEAGRASS:
MICROBES AS A PUTATIVE MARKER OF THE SEAGRASS
ECOLOGICAL STATUS**

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Seagrass meadows are one of the most valuable marine ecosystems on earth as they support complex community and provide important ecosystem services related to human life. Despite their ecological importance, seagrasses are under threat due to anthropic pressure and climate change, affecting the associated community with a bottom-up effect. Many efforts are spent in the development of monitoring tools that could highlight early clue of stress, allowing enhancing the conservation efforts before the decline become unrecoverable. The microbial epiphytic communities represent the new frontiers in the understanding of seagrass ecology as they may have a role in seagrass environmental responses and adaptation capabilities. Plants and microbes build-up complex association called 'holobiont' in which plants provide to the associated microbiome metabolic products and microbes provide to the host protection against microbial pathogens, nutrients, and detoxifying capabilities. Microbial associated populations that change more rapidly than the host under changing environmental condition can enhance the holobiont success, suggesting they could be early indicators of the plant ecological status. Studies regarding the presence of different epiphytic microbial communities suggest a high level of complexity but any link among plants and the microbial epiphytes have been clearly revealed yet.

The aim of my Ph. D. project is to identify the taxonomy and the structure of the microbial communities associated with seagrasses in order to assess the core microbiome and the changing component according to the environmental conditions, highlighting the relationship among the microbes associated with plants and their ecological status. Two seagrasses species are the research object, the Mediterranean endemic *Posidonia oceanica*, and the tropical Lessepsian migrant *Halophila stipulacea*. *Posidonia oceanica* is the most valuable and vulnerable seagrass in the Mediterranean. It is a climax species supporting wide diverse communities but it is declining at a fast rate with ecological consequences. On the other hand, *Halophila stipulacea* is a pioneer tropical seagrass that invaded the Mediterranean at the expenses of native plants due to its biochemical, morphological and microbial epiphytes plasticity. The project foresees the comparison of these opposite species in their native pristine conditions, to assess plants microbial symbionts in healthy conditions. Moreover, these species will be compared in synthopic conditions in the Aegean Sea, to assess whether plant species rather than the environment drive the microbial communities compositions. This project will advance the knowledge of the seagrass holobiont, assessing the microbial core of *P. oceanica* and *H. stipulacea* and highlighting the relationship among the associated microbes and the plant ecological status, crucial questions to answer in order to develop a microbial early warning indicator.