Short-term responses of marine bacteria and phytoplankton to disturbance in marine coastal areas by automated high-frequency flow cytometry

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Project Summary

Microbes are ruling the planet, thriving in any habitat and performing many chemical reactions that directly or indirectly shape and maintain our environment and its function. In aquatic habitats, phytoplankton and bacteria represent key organisms, the first driving photosynthesis and therefore boosting up the whole food web, the second decomposing organic matter to recycle energy and matter. Phytoplankton and bacteria change very rapidly in reaction to the environmental factors in terms of physiology, abundance, population structure and community composition, due to their short generation times, and are also the first biotic components to respond to alterations. As a consequence, to accurately detect and evaluate their abundance, types and physiological state is of vital importance in order to assess the status of natural aquatic environments and to predict their responses to stressors and global changes currently undergoing at the local and global scales.
This project proposes to investigate fine changes in phytoplankton and bacterial communities at short spatial and time scales. It will focus on coastal areas and coastal lagoons, where impacts of natural and anthropogenic origin are more evident and affect ecosystem services in terms of water quality, aquaculture, fisheries. The study sites are the Gulf of Naples and the surrounding coastal lagoons, the Venice lagoon and the Po river delta in its marine part. These areas represent significant sites from the point of view of human fruition that act as buffer with respect to the offshore (the Gulf of Naples, the Po river estuary) or other coastal areas (the lagoons). For this reason, the processes that act at these sites are most representatives of the different kinds of impact that human activities have on the marine ecosystems. The methodological approach proposes to integrate conventional and innovative flow cytometry with microscopy and molecular techniques, including sequencing, also offering a complete training in the most updated techniques used in microbial ecology. Statistical analyses will help in understanding the relationships of microbes with the environmental factors and to identify the key drivers in the different sites. The project builds upon current collaborations between SZN and CNR-ISMAR of Venice and offers training in several areas also suitable for Research and Development projects with industrial applications.