The distribution, diversity and activity of picoplankton in coastal areas of the Mediterranean Sea with a focus on the Gulf of Naples

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by

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Abstract

Despite the increasing recognition of the crucial role of marine microbes in biogeochemical cycles and the regulation of climate change, there is still a lack of knowledge about their phylogenetic and physiological diversity, and the environmental drivers that regulate their distribution and ecology. This thesis aims to decipher the spatio-temporal distribution of the picoplankton assemblages, with a focus on the diversity, community composition and potential activity of its bacterial component, along the eastern Tyrrhenian Sea, with a special focus on the Gulf of Naples. The distribution of *Synechoccocus*, *Prochlorococcus* and picoeukaryotes (autotrophs) and heterotrophic bacteria was investigated using flow cytometry, while insights in the phylogenetic diversity and community composition of the bacterial component were obtained using high-throughput sequencing of the V4 and V5 hypervariable regions of the 16S rRNA gene. Potential metabolic activity of individual bacterial taxa relative to their abundances was also assessed using the ratio of 16S rRNA:16S rRNA gene sequences. Results demonstrate that the abundances of picoplankton were strongly regulated by a combination of different environmental factors and complex hydrological features leading to a heterogeneous distribution and dynamics across space and time. High resolution investigation of the taxonomic groups of the bacterioplankton communities also showed high beta-diversity, with the rare phylotypes contributing to a major proportion of the shifts in community composition at short spatial, seasonal and hourly scales. The spatio-temporal shifts in the community composition suggested that the individual taxonomic groups might be adapted to distinct niches. Another finding of this study is that many of the rare taxa exhibit higher potential activity than the abundant ones, supporting the hypotheses of their role as a "seed bank", able to respond faster when environmental conditions change.