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Editorial

Biodiversity of Marine Microbes

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Abstract: The Special Issue entitled "Biodiversity of Marine Microbes" aimed at highlighting the significance of marine microbes as primary producers, their participation in complex processes and interactions with both the biotic and the abiotic environment, and their important roles in biogeochemical cycles and ecosystem functioning. The issue includes five research papers, covering the diversity and composition of marine microbial communities representing all three domains of life in various marine environments, including coastal eutrophic areas, ice waters, and lagoons. One paper examined the diversity and succession of bacterial and archaeal communities from coastal waters in mesocosm experiments. The combination of classical tools with novel technological advances offers the opportunity to answer fundamental questions and shed light on the complex and diverse life of marine microbes.

Keywords: algae; prokaryotes; microeukaryotes; coastal eutrophic systems; high-throughput sequencing; blooms; climate change

Marine microbial communities comprise a vast diversity of different evolutionary groups from all three domains of life. Recent technological advances in high-throughput sequencing combined with innovations in classical tools, such as microscopy, have permitted the in-depth examination of these communities, and have advanced our knowledge on the key roles that these microbes may play in marine systems. It is well established that marine algae contribute half of the planet's primary production, microeukaryotes are key players as top-down heterotrophs on marine trophic webs, and bacteria and archaea are essential links in global biogeochemical cycles and marine ecosystem functioning. However, many questions remain underexplored, which are relevant, for example, to the response of coastal protistan communities in high eutrophication conditions, the diversity of picoeukaryotes in extreme environments such as ice waters, the phytoplankton composition along variable conductivity gradients, the effects of hydrography on the marine microbial communities' structure, and the changes in picoplankton under different light conditions and bloom events.

This Special Issue comprises five research articles attempting to tackle the above-mentioned subjects of the biodiversity of marine microbes. Genitsaris et al. investigated the plankton community's composition and abundance in an urban eutrophic coastal area of the Mediterranean, amid frequent and persistent phytoplankton blooms, red tide events, mucilaginous aggregates, and the proliferation of potentially harmful species. This paper provided evidence of the eutrophication effects on the response of eukaryotic plankton assemblages and their impact on water quality and ecosystem services [1]. A metagenomic study of the under-ice photosynthetic picoeukaryotes of the White Sea basin, by means of 18S rRNA gene high-throughput sequencing, indicated that environmental variability in extreme marine environments could lead to a significant shift in microbial communities' composition and structure [2]. In addition, a study of phytoplankton diversity patterns along salinity variations in Mediterranean lagoons suggested that the communities' heterogeneity was highly associated with the recorded differences in conductivity among the different sites [3]. Similarly, Gong et al. showed that spatial hydrographic variability in Taiwan Strait lead to significant variations in all the components

of the microbial food web, including viruses, picoplankton, nanoflagellates and ciliates, and showed that, during the cold months, a "viral loop" might contribute to the top-down control of bacterial populations [4]. Finally, one paper in the Special Issue concerned a mesocosm experimental set-up, aiming to investigate bacterial and archaeal diversity and succession in changing light regimes during phytoplankton growth. This study confirmed that light irradiance can affect marine bacterial communities' structure both directly and indirectly, which in turn can have significant implications for a marine ecosystem's response to environmental change [5].

In my view, and according to the published information in this Special Issue, the main challenge of the coming years and the main goal of the future marine microbiologists, is to successfully combine novel technological advances and integrate the recent sequencing breakthroughs with the classical analytical tools, in order to reveal the true vast diversity of marine microbes and to understand the structure of these communities in relation to abiotic disturbances, environmental pressures and biotic relations.

Conflicts of Interest: The author declares no conflict of interest.

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