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Editorial: The Interplay Between Freshwater Microorganisms and Water Quality

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Editorial on the Research Topic

The Interplay Between Freshwater Microorganisms and Water Quality

The health of freshwater bodies is critical for human society in the context of expanding human society and anthropogenic stressors, like urbanization, artificial reservoirs etc. Aquatic microorganisms are one of the most important indicators of freshwater health and quality (Boyd, 2015). On the one hand, aquatic microorganisms can be used for improving water quality through elemental cycling and material transformation (Hong et al., 2018). On the other hand, water quality influences the community structure of aquatic microorganisms, which determineds their elemental cycling functioning (Yan et al., 2018). A better understanding of the role of microorganisms in the aquatic environment would enable us to protect, and plan sustainable management actions to restore aquatic ecosystems and improve freshwater health. This Research Topic focuses on understanding The Interplay between Freshwater Microorganisms and Water Quality, by using novel data, methods and modelling to better understand the interactions between geochemical processes and microorganisms in the aquatic environment. This special issue features 6 articles from 48 different authors.

Yue et al. examined bacterial communities in the stratified water columns and sediments in two different trophic reservoirs using quantitative real-time PCR and high-throughput sequencing. Their results showed that emergence of thermal stratification was responsible for the vertical stratification of bacteria in water and affected the bacterial community structure together with nutrients. Chou et al. used a coupled one-dimensional hydrodynamic-lake ecosystem model to quantitatively assess the impacts of external nutrient loading on water quality and microbial communities in a reservoir. The model predicts higher phytoplankton biomasses in the scenarios with increasing external phosphorus loading, calling for strict control of the external nutrient loading to maintain good drinking water quality in the reservoir.

Wen et al. analyzed the interannual and seasonal changes in the water level of a freshwater lake over past 68 years to explore water level responses to human activities and climate change, proposing that water level can be regulated from an ecological perspective to gain economic returns in order to reach a win-win situation. Yuan et al. studied responses of water quality and aquatic plant community to the removal of Trapa in littoral zone of a northern bay in Erhai. Although the removal of Trapa improved the water quality and increased the productivity of the submerged aquatic plant community, it reduced the species diversity of the aquatic plant community in the long run, raising another issue that will require specific attention in the management practice.

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Sun et al. used eDNA in a reservoir to investigate potential links between water quality and the microbial population on a long-time scale in a reservoir. Historical changes in the water condition can be depicted by changes in the bacterial communities stored in the sediment using sedimental eDNA, showing capacity of this technique to reconstruct historical environmental impact on water bodies. Xiao et al. compared the biogeographical and spatio-temporal patterns of the bacterioplankton community in Zhangxi river along a gradient of urbanization. They found more pronounced seasonal patterns than spatial variability in bacterioplankton community structure in the river system.

In summary, this Research Topic range from urbanised rivers to natural lakes, the vertical to the horizontal level, model predict to interannual investigation. The subjects studied include nutrients elements, bacteria, algae, and eDNA. Articles in this Research Topic exemplify how microbes and freshwater environment interacts at different spatial and temporal scales and their significant role in controlling water quality. Studies tip us how to gain economic returns, and deal with the impact of human activities and climate change from an ecological perspective.

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AUTHOR CONTRIBUTIONS

PB initiated the Research Topic and invited other editors. The editorial was written jointly by the editors of the Research Topic.

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