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題目 : Weekly variations of viruses and heterotrophic nanoflagellates and their potential impact on bacterioplankton in shallow waters of the central Red Sea

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Abstract

Bacterioplankton play a pivotal role in marine ecosystems. However, their temporal dynamics and underlying control mechanisms are poorly understood in tropical regions such as the Red Sea. Here, we assessed the impact of bottom-up (resource availability) and top-down (viruses and heterotrophic nanoflagellates) controls on bacterioplankton abundances by weekly sampling a coastal central Red Sea site in 2017. We monitored microbial abundances by flow cytometry together with a set of environmental variables including temperature, salinity, dissolved organic and inorganic nutrients and chlorophyll a. We distinguished five groups of heterotrophic bacteria depending on their physiological properties relative nucleic acid content, membrane integrity and cell-specific respiratory activity, two groups of Synechococcus cyanobacteria and three groups of viruses. Viruses controlled heterotrophic bacteria for most of the year, as supported by a negative correlation between their respective abundances and a positive one between bacterial mortality rates and mean viral abundances. On the contrary, heterotrophic nanoflagellates abundance covaried with that of heterotrophic bacteria. Heterotrophic nanoflagellates showed preference for larger bacteria from both the high and low nucleic acid content groups. Our results demonstrate that top-down control is fundamental in keeping heterotrophic bacterioplankton abundances low ($< 5 \times 10^5$ cells mL^{-1}) in Red Sea coastal waters.

Keywords: heterotrophic bacteria; Synechococcus; heterotrophic nanoflagellate; viruses; top-down control; Red Sea