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Editorial: Marine plankton: biological and chemical interactions

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Editorial on the Research Topic
Marine plankton: biological and chemical interactions

Studies aimed to understand the marine biological and chemical interactions have been more difficult to conduct than those in terrestrial environments due to the challenges of exploring an environment that is difficult for human access. Undoubtedly, biotic interactions together with chemicals released into the environment have shaped marine plankton communities. Cutting-edge technologies have allowed us to gain a more specific and detailed understanding of the fascinating and intriguing regulation of marine plankton communities.

The Research Topic "*Marine Plankton: Biological and Chemical Interactions*" brings together studies of food webs in marine ecosystems, from diverse geographic regions. To understand the impact of biotic and abiotic factors on the regulation of the plankton community, six papers with the participation of 46 authors employed up-to-date methodologies such as quantitative polymerase chain reaction assay, DNA metabarcoding, flow cytometry, bio-optics, and chemical cue analyses. Below we summarize the content of these papers and highlight their contributions.

DNA metabarcoding has been increasingly used in recent decades to study planktonic communities. Three studies included in this Research Topic used this methodology to investigate geographic differentiation, seasonal changes, and diversity and biogeography along the coasts of America and Asia. Rhodes et al. characterized microbial communities using DNA metabarcoding and flow cytometry along the northwest coast of the United States (Cape Mendocino) and Canada (Queen Charlotte Sound). Eukaryotic microbial communities showed a strong geographical differentiation compared to bacterial and archaeal communities; also, various seawater factors were decisive in shaping these communities. Lin et al. used environmental DNA (eDNA) metabarcoding to understand the influence of trophic groups on the complexity and stability of species networks in subtropical coastal waters of the northern South China Sea. They observed a loose interaction network during summer with a lower biodiversity compared to spring. Also, a close correlation was found among species interactions, environmental factors and biodiversity. Their findings

suggest that the diversity of producers is the foundation of network complexity and influences its stability, whereas the diversity of consumers and their variability of predation strategies may lead to differences in the network stability across seasons. Wu et al. performed a metabarcoding survey using hypervariable regions of 18S rRNA to understand the diversity and biogeography of dinoflagellates in the Kuroshio Current and the influence of environmental factors. Communities of free-living dinoflagellates differed with depth and nutrient concentrations. At greater depths and farther away from the coast, dinoflagellate genetic diversity decreased. Additionally, Harmful Algal Bloom assemblages were less common on the continental shelf in nutrient rich waters than in areas influenced by the Kuroshio Current.

One study of benthic dinoflagellate species distribution was included in this Research Topic. Based on the isolation of benthic *Coolia* dinoflagellate strains, morphological and molecular analyses Hyung et al. identified two species of *Coolia* in South Korean coastal waters reporting *Coolia palmyrensis* in this region for the first time. By using qPCR assay, they revealed that this species occurred in seaweeds around Jeju Island, whereas *Coolia malayensis* was only observed further north. These findings, along with a decade of monitoring data, confirmed the introduction and establishment of *C. palmyrensis*, as well as habitat shifts of *C. malayensis*, providing the first insights into the migration patterns of these benthic dinoflagellates in this region.

Satellite ocean color data offers an effective means of observing possible changes in the state of marine ecosystems (Glukhovets, 2023). Due to the complex optical characteristics of coastal Antarctic waters, Tripathy et al. analyzed bio-optical properties to comprehend their interaction and variability in relation to the physicochemical conditions in Prydz Bay. Results indicated that the upper stratified layer was caused by the influx of glacial meltwater and lower wind activity. The light abortion properties suggested the prevalence of a 'pigment packaging' effect in surface and deeper layers, reflecting variability in phytoplankton productivity (PP). PP variability was better explained by aph(λ) than by the content of chlorophyll-*a*, reaffirming the advantages of using the aph(λ)-based approach for estimating PP from satellite sensors over the traditional chlorophyll-*a* method. These results significantly affect calculations of the biological pump`s contribution to the global carbon cycle, and this approach should be confirmed in other regions.

In the Antarctic Peninsula, to gain a deeper understanding of the trophic interactions of Antarctic krill (*Euphasia superba*). Hellesey et al. measured the effect of penguin guano (a presumed predator cue), chlorophyll concentration, and flow speed on krill swimming behavior. In the presence of guano, these crustaceans made sharper turns and altered their swimming speed, clearly demonstrating an instinct to evade negative chemical signals associated with penguin guano. When exposure was prolonged, feeding decreased, impacting krill's nutritional value, prey survival, as well as carbon sequestration in the ocean. These findings suggest that krill use chemical signals to adjust their behavior in response to food availability and predation risk.

All the studies of the Research Topic demonstrate the value of advanced tools for detecting the presence of marine microorganisms, emphasizing their role in biodiversity monitoring and real-time detection of species composition (Lin et al.). The value of integrating microbial sampling and analysis with broad-scale oceanographic surveys to gain insights into pelagic community structures is highlighted (Rhodes et al.). Detailed information is provided on the influence of environmental factors (Lin et al.), biotic interactions and chemical cues, trophic strategies in dinoflagellates (Wu et al.), and phytoplankton productivity (Tripathy et al.). A first insight into migration patterns among benthic *Coolia* species is also presented (Hyung et al.).

The findings presented in the Research Topic shed new light on the intricate interactions within plankton communities, spanning from sub-tropical to polar regions, and shaped by environmental, biological, and chemical factors. This information is crucial and highlights the value of high-quality data obtained using cutting-edge technologies, contributing to our understanding of the impacts of human activities and climate change on marine plankton ecosystems.

Author contributions

CB-S: Conceptualization, Writing – original draft, Visualization. CH-G: Writing – review & editing, Conceptualization. AD-M: Writing – review & editing. JF: Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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