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Editorial: Ocean-biota system: integrated approach to climate change impacts on plankton communities in coastal and pelagic environments

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Editorial on the Research Topic
Ocean-biota system: integrated approach to climate change impacts on plankton communities in coastal and pelagic environments

Interactions between physical and biological processes within the Ocean-Biota system are at the base of the ecosystem functioning in coastal and pelagic environments. Tipping points in the climate systems are now a relatively well-understood topic in physical sciences whereas plankton communities' response to climate shifts on a small scale and in the long term is still largely unclear and critical points are difficult to predict or even detect.

Progress can be made in tackling this very challenging issue by combining oceanographic findings with information derived from taxonomy, functional ecology and promising molecular techniques.

In agreement with this rationale, the articles that are part of the present Research Topic collection exhibit at least one of the following three elements referring to plankton communities: (i) interactions between physical and biological processes; (ii) effects at various scales of climate change; and (iii) combination of innovative and traditional techniques.

They cover a broad range of communities and ecosystems. Geographic locations include the Arctic (Joo et al.), the Adriatic Sea (Aubry et al., Camatti et al.), the Taiwan Strait (Zhong et al.), and the Bohai Sea (Sun et al.) for natural communities, with a couple other studies using mesocosms (Briddon et al., Cherif et al.). Studies mostly targeted phytoplankton (Joo et al., Aubry et al., Zhong et al., Briddon et al., Cherif et al.) but also zooplankton (Camatti et al.) and mullet larvae (Sun et al.). Even authors were geographically diverse, with first authors based in China, South Korea, Italy, Romania, and Sweden.

This diversity extends to diversity in findings. Most studies found changes in plankton communities linked to spatial variability (e.g., latitudinal, Joo et al. or transitional vs coastal, Aubry et al.), natural temporal variability (e.g., ENSO, Zhong et al.), and climate trends (e.g., Camatti et al.). Internal reorganization of plankton communities (Zhong et al.) and resilient adjustments of dominance structure and assembly mechanisms have been observed as a response to slow-varying forcings and climate-related habitat drifts (Camatti et al.).

However, phytoplankton responses were not always as expected. This was particularly true in mesocosm experiments, highlighting the complexity of phytoplankton response to climate change. One experiment (Briddon et al.) did not find any competitive advantage to phytoplankton acclimatized to high temperature or CO_2 levels for eukaryotes. Another (Cherif et al.) did not find the expected shifts to diatoms in high turbulence regimes and dinoflagellates in low turbulence regime. This suggests that more work is needed to identify environmental drivers of observed plankton community changes, in order to predict future climate-driven changes and address habitat conservation and marine ecosystem integrity strategies.

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Conflict of interest

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