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Editorial: Climate oscillations and impacts on marine food sources

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Editorial on the Research Topic
Climate oscillations and impacts on marine food sources

The biosphere is maintained by wildlife services, but climate influences the economy of each ecosystem. The Research Topic '*Climate Oscillation and Marine Food Sources*' reflects on the climatic impacts on the distribution, availability, and dispersal of living organisms in the biosphere. However, the demand for food sources involves energy transfer in food networks. Unfortunately, humans occupy every terminal tier of the energy pyramid. The vigorous harvest of resources generates carbon footprints, and these footprints add heat to the surrounding atmosphere. In return, every ecosystem can experience different microclimate conditions. Only tolerant or adaptable species can thrive into dominance. For example, fish disperse while other animals change habits with climate variability.

Warm climate conditions are responsible for the increased primary productivity in the Arctic Sea (Brandt et al.). Despite providing benefits such as increased food sources, regrettably, warmer environments are intolerable for some species. In this region, endemic aquatic populations are being replaced. Species that thrive in warmer environments are becoming invasive. As a result of being climate resilient, populations that gain richness have the competitive advantage to become dominant. Due to trophic dominance, the Arctic Sea biodiversity is decreasing annually.

Predictions generated by an ensemble model that used a representative concentration pathway scenario (4.5) were used to predict the seasonal distribution of *Scomberomorus niphonius* in China (Yang et al.). The model predicted that 33.2% of its population will collapse by 2050 and by 2100, the population will be further reduced by 43.5%. Recruitment loss or reduction is the resultant impact of warmer seas; high elasticity was a causal factor. For this study, in 2100, emissions (carbon footprints) are forecast to be more than 2-fold worse than that reported in 2022. With these fish populations migrating into areas with a more tolerable climate, the resource pool of the study area was predicted to reduce by 88.9%. If these predictions are realized, in 2100, food insecurity could be a globally threatening process.

Microbes and their diseases are more prevalent in warm climate conditions. However, this is not true for *Vibrio* spp. (Sheikh et al.), because its virulence is temperature independent. For instance, *V. parahaemolyticus* populations increase two-fold for every 1°C, and this is supportive evidence for the increased risk of white spot syndrome in shrimp fry during the summer months. Another species, *V. cholerae* is waterborne and is responsible for the increased prevalence of cholera in tropical regions, which is also associated with warm climate conditions. The *V. alginolyticus* populations also increase exponentially with every 1°C increase in environmental temperature. This microbe is responsible for fatal food poisoning during summer months in every region of the world.

Climate oscillation causes temporal shifts in marine life distribution and in Baja (California), warm weather promotes increases in Red Sea urchin populations (Medellin-Ortiz et al.). In ambient conditions, this sea urchin exhibited a normal population recovery of 65-82% after considering threats, predation, and harvest. However, its population collapses during extremely warm weather conditions, particularly during the *El Nino*. Despite the increasing food sources due to eutrophic conditions, not all grazers (for example the Red Sea urchin) can adapt well to these conditions. Therefore, thermal stratification in reef and kelp ecosystems could be managed by momentarily pausing harvest. This ensures the survival and recovery of corals, grazers, and browsers.

Many ecosystems are supported by biomass structures that have similar demands for sustenance (Eskuche-Keith et al.). Trophic redundancies are higher in coastal environments than offshore due to foraging and mobility. Also, the emergence of generalists that cope with wide climate variations not only threatens the survival of specialists but also changes the structure and diversity of food webs. While temporal shifts in climate disrupt the prey-predator relationships, closely related or grouped species with similar demands could occupy different trophic positions in comparable environments.

This Research Topic successfully addressed the impacts of climate oscillation through articles that examined seasonal transition and the resultant temporal shifts in marine life distribution and availability. While the biodiversity of one area is specialized to support the economy of an ecosystem, areas inhabited by generalist and specialist species are governed by different economy operators. Therefore, due to natural selection, certain species may adapt well to new environment settings and thrive into dominance. However, food sources play a minor role to increase the richness of a species but in all environments, a species' dominance prevails until a plateau is reached. Hence, succession could recover an ecosystem, but the climate must be conducive if each species is to regain their populations.

Author contributions

BN - Prepared the manuscript; SP - Methodology; TS - Literature; QT - Reviewed the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

Author SP was employed by the company NatNov Bioscience Pvt Ltd.

The remaining 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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