frontiers | Frontiers in Marine Science

TYPE Editorial
PUBLISHED 10 June 2025
DOI 10.3389/fmars.2025.1634908

OPEN ACCESS

EDITED AND REVIEWED BY
Ilaria Corsi,
University of Siena, Italy

*CORRESPONDENCE
Xuchun Qiu
xuchunqiu@ujs.edu.cn

RECEIVED 25 May 2025
ACCEPTED 30 May 2025
PUBLISHED 10 June 2025

CITATION
Qiu X, Chen K, Shimasaki Y and Oshima Y (2025) Editorial: Impacts of emerging contaminants and their ecotoxicological consequences. *Front. Mar. Sci.* 12:1634908. doi: 10.3389/fmars.2025.1634908

Editorial: Impacts of emerging contaminants and their ecotoxicological consequences

Xuchun Qiu[1,2]*, Kun Chen[1], Yohei Shimasaki[3] and Yuji Oshima[3,4]

[1]School of the Environment and Safety Engineering, Jiangsu University, Zhenjiang, Jiangsu, China, [2]Jiangsu Collaborative Innovation Center of Technology and Material of Water Treatment, Suzhou University of Science and Technology, Suzhou, China, [3]Laboratory of Marine Environmental Science, Faculty of Agriculture, Kyushu University, Fukuoka, Japan, [4]Institute of Nature and Environmental Technology, Kanazawa University, Kanazawa, Japan

KEYWORDS

emerging contaminants, aquatic species, biological responses, toxic mechanisms, ecological consequences

Editorial on the Research Topic
Impacts of emerging contaminants and their ecotoxicological consequences

Emerging Contaminants (ECs) in aquatic ecosystems have garnered global environmental concern with the advancement of detection and monitoring technologies. The increasing number and diversity of ECs have shown multiple impacts on biological systems, biodiversity, and ecosystem function in aquatic environments. Furthermore, adverse effects of ECs, particularly those that occur at environmentally relevant concentrations, may appear only when they co-occur with another stressor. However, knowledge about these impacts on aquatic species is still limited. Therefore, this Research Topic focused on exploring the linkages between exposure to emerging contaminants, the biological responses of aquatic species, and their potential ecological consequences, aiming to enhance our understanding of these critical environmental challenges.

This Research Topic comprises 10 articles covering several aspects of emerging contaminants: the impacts and risk assessment of microplastics and nanoparticles, the toxic mechanisms of PPCPs, and the transfer and amplification of pollutants through the food chain.

For the impacts of microplastics (MPs) and nanoparticles (NPs), Esterhuizen et al. investigated the ecotoxicological effects of polystyrene (PS) leachates on *Daphnia magna* and *Artemia salina*. Results showed higher mortality in *A. salina* exposed to seawater leachate, and sublethal concentrations triggered elevated antioxidant enzyme activities in both species. The findings underscored the need for monitoring species-specific impacts of MPs and their leachates. Inagaki et al. investigated the cytotoxic effects of titanium dioxide (TiO_2) NPs on the benthic foraminifer *Ammonia veneta*. The results indicated that TiO_2-NPs at ≥ 5ppm could disrupt the foraminiferal detoxification system.

Studies also provide some new evidence that co-exposure to MPs and chemical contaminants may alter the combined toxicity to aquatic species. Aldraiwish et al. investigated the multifaceted effects induced by MPs and the statin Lipitor on marine benthic nematodes. Results showed that PVC or Lipitor alone significantly reduced nematode abundance, biomass, and diversity, with higher mortality in microvores and diatom feeders. However, combining PS-MPs with Lipitor attenuated toxicity via physical

adsorption, minimizing negative impacts. The findings suggested PS-MPs as a potential remediation tool by reducing Lipitor bioavailability. Pradit et al. reported the distribution and ecological risks of MPs and heavy metals in sediments of Songkhla Lagoon, Thailand. The results suggested that pollution of MPs and heavy metals exhibited ecological risk factors to both ecosystems and human health, which highlighted the risk of MP-heavy metal co-contamination of aquatic ecosystems.

For the impacts of pharmaceuticals and personal care products (PPCPs), Tao et al. investigated the reproductive consequences of a life cycle exposure to 2-phenylbenzimidazole-5-sulfonic acid (PBSA, an organic UV filter) in zebrafish. Results showed that PBSA exposure could disturb fish reproduction through endocrine-disrupting effects and transgenerational toxicity, emphasizing the necessity for environmental regulations on UV filters. Lin et al. investigated the ecotoxicological effects of quinolone antibiotics (levofloxacin and norfloxacin) on the marine diatom *Skeletonema costatum*, and the results showed that both antibiotics at high concentrations could inhibit algal growth by impairing photosynthesis and inducing oxidative stress.

Studies also suggested that the transfer and amplification of pollutants through the food chain could significantly increase their ecological risks. Zhang et al. analyzed the contamination of 14 per- and polyfluoroalkyl substances (PFAS) in the Saunders's gull (*Larus saundersi*) and its food chain in Yellow Sea coastal wetlands. The results suggested that PFSA could be transferred maternally in *L. saundersi*, with bivalves and polychaetes as the primary contributors to PFAS contamination in food sources. In addition, Ni et al. reported the transfer of radionuclides and radiation dose assessment for marine organisms on the eastern coast of Yantai City. Binder et al. assessed the ecotoxicological impacts of munitions leakage from WWII shipwrecks in the Belgian North Sea using caged blue mussels (*Mytilus edulis*) and fish (*Trisopterus luscus*). Multi-biomarker analysis revealed oxidative stress in mussels and lysosomal membrane destabilization. The findings highlight subcellular toxicity in mussels and underscore the ecological risks of historical munitions in marine environments.

Overall, articles in this Research Topic provide some new insights into the impacts of emerging contaminants and their ecotoxicological consequences. The findings are crucial for the environmental risk assessment of these pollutants. Although there is increasing recognition of the importance of a multi-stressor approach to aquatic ecosystems, there is still a lack of knowledge on this topic, especially regarding the ecological consequences of the combined effects of emerging contaminants and other environmental stresses. Such studies are still needed to achieve a more comprehensive understanding of the potential ecotoxicological consequences of long-term exposure to emerging contaminants on aquatic species worldwide.

Author contributions

XQ: Writing – review & editing, Writing – original draft. KC: Writing – review & editing. YS: Writing – review & editing. YO: Writing – review & editing.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. This work was supported by the National Natural Science Foundation of China (Grant No. 32071623).

Acknowledgments

We thank all authors, reviewers, and editors who have contributed to this Research Topic.

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.

Generative AI statement

The author(s) declare that no Generative AI was used in the creation of this manuscript.

Publisher's note