frontiers | Frontiers in Marine Science

TYPE Editorial
PUBLISHED 22 May 2025
DOI 10.3389/fmars.2025.1614900

OPEN ACCESS

EDITED AND REVIEWED BY
Marta Marcos,
University of the Balearic Islands, Spain

*CORRESPONDENCE
Qing Wang
wq@bnu.edu.cn

RECEIVED 20 April 2025
ACCEPTED 07 May 2025
PUBLISHED 22 May 2025

CITATION
Wang Q, Zhu Q and Shao D (2025) Editorial: Processes, mechanisms and solutions in coastal wetland to adapt to changing environment. *Front. Mar. Sci.* 12:1614900. doi: 10.3389/fmars.2025.1614900

Editorial: Processes, mechanisms and solutions in coastal wetland to adapt to changing environment

Qing Wang[1,2,3]*, Qin Zhu[4] and Dongdong Shao[1,3]

[1]State Key Laboratory of Wetland Conservation and Restoration, Beijing Normal University, Beijing, China, [2]Research and Development Center for Watershed Environmental Eco-Engineering, Advanced Institute of Natural Sciences, Beijing Normal University, Zhuhai, China, [3]Yellow River Estuary Wetland Ecosystem Observation and Research StationMinistry of Education, Dongying, China, [4]Southern Marine Science and Engineering Guangdong Laboratory (Guangzhou), Guangzhou, China

KEYWORDS

coastal wetlands, climate change, ecological process, adaptive solutions, conservation

Editorial on the Research Topic

Processes, mechanisms and solutions in coastal wetland to adapt to changing environment

Coastal wetlands provide valuable ecological services, such as coastal protection, carbon storage, flood mitigation, and food production (Kirwan and Megonigal, 2013; He and Silliman, 2019; Newton et al., 2020). Each type of coastal wetland (i.e., salt marshes, mangroves, sea grasses) has its adaptive strategies to face the changing environment. In the context of climate change and anthropogenic activities, external disturbances are more complicated and changeable, causing the responses of species and ecological processes to be more secluded and unpredictable (Kirwan and Megonigal, 2013; Schuerch et al., 2018; FitzGerald and Hughes, 2019). Elucidating how these coastal ecosystems adapt to the changing environment, especially the key processes, mechanisms and solutions are quite important and urgent. We aim to advance discussions on various processes, mechanisms, and solutions to multiple challenges in coastal wetlands all over the world. This Research Topic collects 10 research papers, which include hydrological, biological, and chemical processes, together with their relationships and influence mechanisms in salt marshes, seagrass, estuarine waters, and mariculture ponds.

Two papers have studied the physical processes of brine dispersal (Xue et al.) and winter storms (Tian et al.). Xue et al. conducted a numerical simulation to reveal the effects of brine dispersal under the combined influence of river flow and tides. They found that releasing brine in areas with strong currents helps it mix and spread better. Tian et al. did a field study in the Yangtze Delta. They measured waves, currents, water depth, and water clarity. They found that storms, especially in winter, play a big role in moving sediments along the coast. This is important because storms are expected to get stronger with global warming.

Three studies have focused on the relationship between environmental factors and biocenosis, such as archaeal communities (Zhao et al.) and seagrasses (Yi et al.; Fu et al.). Zhao et al. analyzed the diversity and community structure of archaeal in the 0–20 cm soils under different hydrological conditions in the Yellow River Delta. They confirmed that the

variation in soil salinity caused by hydrological conditions is a major driver of the variation of archaeal community structure. Yi et al. focused on a laboratory experiments of the response of sea grass to environmental pressures at different life stages. They mainly considered salinity and turbidity. The results provide a molecular mechanism for the adaptation of seagrass to environmental stress. These findings will help developing coping strategies to mitigate the adverse effects of environmental stress and enhance resilience. Fu et al. also conducted seagrass research using an investigation method in Wenchang, Hainan province. The results show the negative effects of human activities on seagrass. To reverse these degradation trends, controlling multiple human activities and planning rational marine engineering are essential.

Biogenic elements and their cycling are essential processes in wetlands, which are closely linked to carbon storage, vegetation growth, and pollution. Ma et al. studied how tidal flooding through creeks affects carbon and nitrogen in the soil of a Chinese salt marsh. They found that tidal creeks play a key role in how these elements are spread in the marsh. Hua et al. looked at how plant invasiveness and crab activity affect carbon storage. They discovered that crabs have a bigger impact on carbon storage than plant invasion. Zhang et al. did a detailed study on leaf nutrient patterns in coastal wetlands. They found differences in leaf nutrients between native and non-native plants, which should be considered in future studies on nutrient cycles and plant-animal interactions. Liu et al. used the plant *Sesuvium Portulacastrum* to study how it controls dissolved inorganic nitrogen in fish farming ponds. They suggest that coastal plants can help remove nitrogen pollutants from these ponds.

Coastal biological invasions are a big threat to ecosystems. Xu et al. studied how the invasive plant *Spartina alterniflora* affects the native moth *Laelia coenosa*. This moth is known to harm native *Phragmites australis* marshes in China's coastal wetlands. They used field surveys and feeding tests for their study. They discovered a new indirect way that coastal invasions can impact ecosystems. They also stressed the need to consider seasonal changes in plant and herbivore interactions.

We anticipate that the compilation of papers we have assembled will offer clear and valuable insights into the crucial ecological processes occurring in coastal wetlands, presenting management implications and specific strategies to address the challenges posed by environmental changes.

Author contributions

QW: Writing – review & editing, Writing – original draft. QZ: Writing – review & editing. DS: Writing – review & editing.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. The study was supported financially by the Natural Science Foundation of Guangdong Province (2025A1515011055) and the Natural Science Foundation of China (42107057).

Acknowledgments

The editors are grateful to be contributions made by the many authors involved in this project.

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

References

FitzGerald, D. M., and Hughes, Z. (2019). Marsh processes and their response to climate change and sea-level rise. *Annu. Rev. Earth Pl Sc* 47, 481–517. doi: 10.1146/annurev-earth-082517-010255

He, Q., and Silliman, B. R. (2019). Climate change, human impacts, and coastal ecosystems in the anthropocene. *Curr. Biol.* 29, R1021–R1035. doi: 10.1016/j.cub.2019.08.042

Kirwan, M., and Megonigal, J. (2013). Tidal wetland stability in the face of human impacts and sea-level rise. *Nature* 504, 53–60. doi: 10.1038/nature12856

Newton, A., Icely, J., Cristina, S., Perillo, G. M. E., Turner, R. E., Ashan, D. W., et al. (2020). Anthropogenic, direct pressures on coastal wetlands. *Front. Ecol. Evol.* 8, 144. doi: 10.3389/fevo.2020.00144

Schuerch, M., Spencer, T., Temmerman, S., Kirwan, M., Wolff, C., Lincke, D., et al. (2018). Future response of global coastal wetlands to sea-level rise. *Nature* 561, 231–234. doi: 10.1038/s41586-018-0476-5