Role of the Rapporteur

The rapporteur takes notes for highlight(s) of each presentation and the ensuing discussion.

The rapporteur finalizes the session summary shortly after the session and sent it to the Secretariat (imber@ecnu.edu.cn).

A suggested template for a written report

1. Session Introduction

Continental marginal systems are supporting human well-being from important and valuable goods to services, but anthropogenic activity and climate change have substantially altered the oceans and are impacting their ability to sustain ecological and human communities. Integrating environmental, ecological and economic knowledge of continental margin systems, and how these systems may change under different perturbation scenarios, is imperative to understand the interplays between human uses of the oceans, present management strategies of marginal systems, and optimize the services they provide. Lessons learned from multidisciplinary syntheses and inter-regional comparative studies of coastal socio-ecological systems will help rationalize and optimize marginal seas management approaches. This session is aimed at improving our understanding of long-term marginal social-ecological systems, guiding sustainable development of resources and advising governance regimes to facilitate sustainable governance, facilitating equitable sharing of margin resources, and evaluating alternative research approaches and partnerships that address major margin challenges.

2. Name of Convenor: Sumei Liu

Rapporteur: Rong Bi

Number of participants: 6 oral presenters; 5 poster presenters

One or two major highlights from each presentation

Oral Presenter 1 (Rong Bi)

Presentation title: Long-term change patterns of phytoplankton and sediment depth-dependence of bacterial communities in Sanggou Bay

- During the past 70 years in Sanggou Bay, diatoms/dinoflagellates and bacterial diversity showed an increasing trend. However, the change patterns of phytoplankton productivity and bacterial communities showed significant regional differences.
- Phytoplankton productivity was highest in the integrated culture area. Sulfur-oxidizing bacteria potentially enhance carbon sink in this area. Thus, the integrated culture area is expected to potentially enhance marine carbon sequestration.

Oral Presenter 2 (Siraporn Tong-U-Dom)

Presentation title: Response of the lower trophic ecosystem in the eastern Seto Inland Sea to changes in nutrient supply from rivers

- Nutrient inputs from rivers should be carefully examined to assess their local impact on lower trophic levels in each region.
- Phytoplankton groups should be accurately represented in each region, reflecting the diversity found in real coastal seas. Other factors should also be considered, such as land reclamation, climate change, and nutrient loss from sediments.

Oral Presenter 3 (Huikun Yao)

Presentation title: Joint effect of aquaculture and land reclamation on sediment dynamics

- In the past 20 years, the aquaculture and land reclamation area increased by a factor of 25 and 3.4 times, respectively. In the subtidal area, the aquaculture-bed double boundary effect reduces the surface flow velocity, and the maximum flow velocity shifted downward, increasing velocity in the middle and lower layers. This enhances sediment resuspension and leads to intensified erosion.
- While in the intertidal flat, the hydrodynamics were weakened by reclamation dam reflection effect, and resulting the deposition increased. Long-term aquaculture and land reclamation activities have increased subtidal erosion and intertidal deposition in Sansha Bay, making the bay profile steeper and increasing geomorphic instability.

Oral Presenter 4 (Suzhen Yang)

Presentation title: Study on health evaluation of human-ocean coupling system under climate change and human activities

- A systematic health evaluation framework is proposed: integrating the interactions among human sea use coordination, water cumulative effect, and ecosystem services, and emphasizing the concrete coupling processes between human activities and natural systems.
- Various spatial models and spatial correlation analysis methods are introduced: Compared to traditional methods relying on limited sampling stations and frequency monitoring data, this study reveals the spatial coupling patterns of human sea use, water cumulative effect, and ecosystem services. The ecosystem service is the main factor affecting the health level of Xiamen Bay.

Oral Presenter 5 (Yanhong Xu)

Presentation title: Phytoplankton community succession in the East China Sea over the past 300 years driven by climate change: Evidence from sterols

- Since the 1840s, the primary productivity of phytoplankton has increased significantly, with a rapid rise observed in the 21st century. Over the past 300 years, temperature has been the primary driver influencing the phytoplankton community structure in this region.
- Marginal sea ecosystems are highly sensitive to global climate change, exhibiting pronounced ecological responses.

Oral Presenter 6 (Yanqun Yang)

Presentation title: Cost-effectiveness optimization method for eutrophication mitigation measures in the Bohai Sea

- Suggestions and Prospects: Construct a response-regulation-feedback model covering the entire chain of social economy - pollution sources - river basins – bays.
- The improvement targets of eutrophication such as the threshold of nitrogen and phosphorus nutrients for eutrophication in the Bohai Sea (i.e., the benchmark concentration value of eutrophication water quality in the nearshore area) still need in-depth research.

Poster Presenter 1 (Xin Zhao)

Presentation title: Optimizing rights-based management for global fisheries sustainability: A comparative analysis of use rights

- Catch RBM provides a more effective fisheries management framework than Effort RBM, particularly in terms of transferability, security, flexibility, and exclusivity. Its success is closely linked to economic development, co-management approaches, and strong leadership

within fishing communities, making it a preferred model for sustainable fisheries reform—especially in developed nations.

- Economic conditions and governance structures critically influence RBM success: Effort RBM requires robust administrative control (e.g., marine protected areas, spatial management), while Catch RBM thrives in economically developed settings with cooperative management. For developing countries facing overfishing (e.g., China, Indonesia, India), enhancing access rights and economic capacity is essential for transitioning to effective, rights-based systems.

Poster Presenter 2 (Longyun Lai)

Presentation title: Dissolved nitrogen in a tropical river-sea continuum: A seasonal view on the distribution and transformation

- Dissolved organic nitrogen (DON) dominates the nitrogen pool in tropical blackwater rivers (e.g., the Belait River), with higher concentrations in the dry season, likely due to enhanced photodegradation-driven mineralization of terrestrial organic matter. In contrast, the wet season showed elevated NH_4^+ but reduced DON and NO_3^- levels, highlighting the strong influence of hydroclimatic conditions on nitrogen speciation.
- Salinity gradients shape nitrogen dynamics seasonally: DON decreased seaward in the dry season, while NH_4^+ and NO_3^- accumulated via ammonification and nitrification. Wet-season DIN accumulation was attenuated due to rapid flushing and shorter water residence time. Microbial communities (e.g., nitrifiers like Nitrososphaera and denitrifiers like Bacillus) further regulated nitrogen transformations, underscoring the role of environmental conditions in biogeochemical processes.

Poster Presenter 3 (Zihao Feng)

Presentation title: Impact of sediment release strategies on estuarine dynamics: Analyzing the effect of mud mantling and its implications for sediment management

- In short-distance sediment release (<250 km), higher mud content in released sediment significantly reduces sand deposition in estuaries, particularly when the initial bed mud content is high. Larger sediment nonuniformity further lowers the critical mud fraction threshold, offering practical guidance for reservoir sediment management strategies.
- The mud-mantling effect diminishes when sediment release exceeds 250 km, highlighting the spatial limitation of reservoir-based sediment replenishment. This underscores the need to reconsider sediment management approaches in regulated river systems to address coastal erosion and carbon sequestration challenges effectively.

Poster Presenter 4 (Chen Zhong)

Presentation title: Destabilization of iron-bound organic carbon in coastal sediments under dynamic sedimentary conditions

- Hydrodynamic and sedimentary processes dominantly regulate Fe-OC distribution in estuarine sediments: The marked enrichment of Fe-OC in the hypoxic zone off the Changjiang Estuary (DH: 1.622, HH: 2.611, PP: 0.827 $mg \cdot g^{-1}$) during summer highlights the combined effects of seasonal hydrology and anthropogenic perturbations (e.g., riverine fluxes) on carbon-iron sequestration.
- Fe-OC speciation reveals complex land-to-ocean transition dynamics: Contrasting patterns between the Changjiang and Gulf of Thailand systems underscore the roles of sediment properties (e.g., grain size, mineralogy) and depositional environments in Fe-OC stabilization. This study advances the understanding of particulate iron-OC coupling in river-dominated

margins and provides critical benchmarks for interpreting modern and paleo-sedimentary archives.

Poster Presenter 5 (Narriman Saleh Jiddawi (online))

Presentation title: Women empowerment at the grassroot level along the coast of Zanzibar, Tanzania

- Women in Zanzibar play vital but unequal roles in coastal economies: Despite their key contributions to seaweed farming, shellfish collection, and fisheries, women face systemic marginalization due to cultural, religious, and economic barriers, resulting in small-scale operations and lower incomes compared to men.
- Empowerment programs show potential yet require structural reforms: Initiatives like alternative livelihoods (pearl farming, jewelry-making), skills training (swimming, cooperatives), and microfinance (SACCOS) have improved women's agency, but persistent gender norms and scalability challenges demand sustained policy and cultural interventions for transformative impact.

One paragraph of session summary

This session presented critical insights into long-term ecological changes in coastal ecosystems and their interactions with human activities. Rong Bi highlighted regional disparities in phytoplankton productivity and bacterial community shifts over 70 years in Sanggou Bay, noting the integrated aquaculture zone's potential to enhance carbon sequestration through sulfur-oxidizing bacteria. Siraporn Tong-U-Dom emphasized the need for localized assessments of riverine nutrient impacts on coastal food webs, stressing the importance of accounting for land reclamation, climate change, and sediment nutrient dynamics. Huikun Yao revealed how aquaculture expansion and land reclamation in Sansha Bay over two decades have altered hydrodynamic patterns, exacerbating subtidal erosion and intertidal deposition, thereby increasing geomorphic instability. Suzhen Yang proposed a holistic health evaluation framework for marine ecosystems, integrating human-sea interactions, cumulative water effects, and ecosystem services, with spatial models uncovering key drivers of Xiamen Bay's health. Yanhong Xu traced phytoplankton productivity trends since the 1840s, identifying temperature as the dominant factor shaping community structures and underscoring marginal seas' vulnerability to climate shifts. Finally, Yanqun Yang called for developing a systemic "society-pollution-watershed-bay" response model while urging deeper research into eutrophication thresholds in the Bohai Sea. Looking ahead, the working group plans to curate a special issue exploring long-term ecological changes and their societal linkages. Participants are encouraged to contribute further research and share feedback with the IMBeR office. We extend our gratitude to all presenters and attendees for their valuable contributions and wish everyone a productive and enjoyable experience in Shanghai.

Suggestions for IMBeR 3.0 from this session (one or two bullet points):

- **Enhance cross-sectoral collaboration with other activity programs/organizations to co-develop frameworks addressing ecosystem-society interactions**. Foster partnerships with regional management bodies and climate networks to integrate localized insights (e.g., Sanggou Bay's carbon sequestration potential and Bohai Sea's eutrophication thresholds) into global strategies for mitigating cumulative stressors like land reclamation and nutrient runoff.
- **Prioritize capacity-building programs for early-career researchers, focusing on interdisciplinary tools such as spatial modeling, socio-ecological health assessments, and long-term data synthesis**. Establish regional training hubs to share best practices from case studies and empower stakeholders to design adaptive governance regimes that balance ecological resilience and human needs.