Session Introduction

With less than 5% of the global terrestrial area, marine islands hold 20% of the world's biodiversity. Biodiversity on marine islands is characterized by unique biogeographic, phylogenetic and functional characteristics, and plays a crucial role for sustaining ecosystem multifunctionality globally. However, marine islands are also experiencing a disproportionate loss of endemic species and a disproportionate gain of invasive species, due to increasing negative human impacts that make islands transitioned from primary through secondary to tertiary economies. In addition to habitat transformation and non-native species introduction, human-induced climate change and sea-level rise are emerging as new threats to biodiversity. Currently, islands are undergoing an unprecedented biodiversity remodeling, with some species going extinct, others changing in abundance, and non-native species becoming a part of many ecosystems. Undoubtedly, such species reassembly processes inevitably lead to unpredictable consequences on ecosystem multifunctionality. In this context, this session aims to stimulate a collaborative discussion to: 1) better understand how island biodiversity may respond to anthropogenic threats such as habitat loss, biological invasion, sea-level rise and climate change, and how the compositional and functional changes of biodiversity influence island ecosystem multifunctionality; and 2) develop new strategies for the protection and restoration of island biodiversity in cultural heritage through regenerative practices, mainstreaming biodiversity in cultural and production landscapes, and engaging with the reality of novel ecosystems.

Name(s) of Convenor and Rapporteur, number of participants

Convenor: Enrong Yan

Rapporteur: Yuhao Zhao

Number of participants: 4

1. One or two major highlights from each presentation

Oral Presenter 1 (Yu-jia Lin) – Habitat analysis identified distinct north-south patterns in fish family abundances along Taiwan's west coast, emphasizing the need for tailored conservation strategies across different essential fish habitats. Conservation prioritization should focus on croakers (Sciaenidae), which are especially vulnerable to global warming and coastal development due to their preference for cold, shallow waters.

Oral Presenter 2 (Jing Wang) – Long-term soil nutrient dynamics on Zhoushan islands reveal persistent decoupling of rock-derived phosphorus (P) from carbon (C) and nitrogen (N), highlighting a mismatch between geological and biological nutrient cycles. Plant-soil feedback mechanisms influence phosphorus availability, suggesting bottom-up control by soil substrates on vegetation growth.

Oral Presenter 1 (Chen Zhu) – In fragmented island forests, large-bodied, dispersal-limited frugivores decline significantly, increasing reliance on small-bodied, highly mobile birds for seed dispersal and ecosystem cohesion. Conservation strategies should prioritize protecting small-bodied, highly mobile bird species and restoring landscape connectivity through large patches and stepping-stone habitats.

Oral Presenter 1 (Yuhao Zhao) – Island bird species richness responds to island biogeographic factors (area and isolation) independently of land-use intensity, but habitat type (farmland vs. forest) significantly affects community assembly patterns. Agricultural landscapes on large islands may support higher bird diversity and should be integrated into conservation planning for island biodiversity management.

2. One paragraph of session summary

This session examines how island biodiversity and ecosystem multifunctionality respond to anthropogenic pressures – from habitat loss and modification to sea-level rise and climate change – drawing on island case studies spanning coastal fish communities, soil nutrient cycles, frugivorous bird networks, and insular bird assemblages. One study of Taiwan's coastal fish communities documents pronounced spatial variation in species composition and identifies conservation priorities essential for protecting these marine ecosystems amid

habitat degradation and climate change. A long-term investigation in the Zhoushan Archipelago reports a decoupling of phosphorus from carbon and nitrogen in island soils, suggesting that chronic environmental changes can disrupt nutrient balances and potentially impair ecosystem multifunctionality. Another presentation spotlights the role of small, mobile frugivorous birds in fragmented island landscapes, demonstrating that these birds serve as critical seed dispersers by maintaining plant regeneration and network connectivity even as larger frugivores are lost from degraded habitats. The final study examines how land-use change interacts with island biogeography to shape bird community assembly, showing that species richness and composition are jointly governed by habitat conversion and the classic effects of island size and isolation. Together, these studies underscore the multifaceted impacts of global change on island ecosystems and offer critical insights to guide conservation efforts.

- 3. Suggestions for IMBeR 3.0 from this session (one or two bullet points):
- ✓ Encourage interdisciplinary research that explicitly integrates marine and terrestrial ecosystem perspectives, given the interconnected nature of island biodiversity.
- ✓ Include more studies focusing on how cultural and socioeconomic factors influence biodiversity conservation on islands, emphasizing human dimensions alongside ecological research.