The University of Hong Kong
School of Biological Sciences

Public Seminar

PHYLOGEOGRAPHY AND PLASTICITY OF MACROALGAE IN A CHANGING OCEAN

Date: 30th January 2026

Time: 9: 00 AM (HKT)

Venue: ROOM 6N11 + Zoom

About the speaker:

Zhong Kaile is a PhD student supervised by Prof. Juan Diego Gaitan-Espitia and Prof. Bayden Russell. Her research focuses on investigating the mechanisms that shape macroalgae diversity and plasticity in response to changing ocean

Abstract:

Macroalgae are highly diverse primary producers in the coastal ecosystem. The diversity, distribution, and phenotypic characteristics of these organisms are the result of historical climatic events and current environmental conditions. These patterns are expected to be altered by current and future climate events, threatening the overall functioning of marine ecosystems. To better understanding of the mechanisms regulating the ecological resilience of macroalgae across temporal and spatial scales, this thesis integrates phylogeographic and eco-evolutionary approaches to assess intra- and inter-specific genetic and phenotypic responses to ocean changes. The thesis begins with an exploration of the phylogeographic patterns of macroalgae in the Northwest Pacific, revealing the impact of historical processes on the species diversity and genetic structure of these primary producers. Specifically, the study of *Ulva*'s phylogeography in the Northwest Pacific illustrates the complexity of species classification, with molecular data revealing high species diversity and low intraspecific genetic diversity despite morphological similarities. This chapter underscores the significant influence of temperature on species-specific geographic distributions. Past environments play a crucial role in determining the distribution and function of macroalgal populations, as well as their responses to current and future environmental changes. To this end, the thesis investigates whether and how thermal adaptations (i.e., tolerances and plasticity) of marine macroalgae are altered by environmental drivers associated with current environmental change (e.g., nitrogen sources and availability), revealing key phenotypic and transcriptional regulatory mechanisms involved. While these mechanisms are fundamental components of short-term physiological acclimation in marine macroalgae, it remains unclear the extent to which they are involved in long-term (e.g., transgenerational) responses, potentially underpinning adaptive strategies. Therefore, this thesis assessed the critical role of intergenerational memory in ecological resilience, offering insights into how marine macroalgae may respond to ongoing climate change. In summary, this thesis provides a comprehensive understanding of how environmental factors shape genetic and functional attributes of marine macroalgae, focusing on their adaptation strategies to historical and contemporary environmental changes.