The University of Hong Kong
School of Biological Sciences

Public Seminar

Thermal Physiology and Metabolic Plasticity Shaping the Distribution of Symbiotic Corals

Date: 30th September 2026

Time: 2:30 pm

Venue: 6N-11 & Zoom

About the speaker:

Joseph Brennan is a PhD candidate researching the impact of climate change on symbiotic corals under the supervision of Dr. David Baker

Abstract:

Anthropogenic climate change is driving the poleward range expansion of tropical marine ectotherms as lower-latitude habitats become increasingly hostile. While higher latitudes offer potential climate refugia, they impose distinct physiological challenges, including severe seasonal variability and harsh winters. Because Scleractinian corals are primarily studied within stable tropical regions, it remains unclear how marginal populations adjust their metabolic strategies to persist under such extreme thermal fluctuation. Current ecological assessments also frequently overlook the influence of localized environmental history on phenotypic plasticity, as well as the hidden metabolic architectures that govern how the coral-algal holobiont responds to thermal stress. To predict which populations possess the acclimatization potential required to take on poleward range expansions, and which face localized extirpation, these gaps must be resolved.

This thesis investigates multi-scalar impacts of climate change on coral holobionts, from intracellular metabolic stress responses to ecosystem redistributions across the Northwest Pacific. Through the comparisons of multiple coral population's thermal performance strategies, development of mechanistic models predicting habitat suitability and range expansion potential, and the investigation of underlying cellular defense mechanisms dictating coral physiological stress responses using novel stable isotope methodologies, this research redefines coral vulnerability. The findings emphasize that resilience is driven by historically forged phenotypic plasticity and intracellular metabolic strategies rather than absolute thermal limits. By establishing the physiological boundaries of expansion, this work underscores the necessity of targeted assisted migration and the protection of viable refugia to preserve coral biodiversity in a rapidly transforming ocean.