The University of Hong Kong
School of Biological Sciences

Public Seminar

Understanding phenotypic plasticity of phytoplankton to changing environments

Date: 19th January (Friday)

Time: 10:00 A.M.

Venue: 6N-11, KBSB

About the speaker:

Mr. Zhenzhen Li is a Ph.D. candidate from the iBEER lab under the supervision of Dr. Juan Diego Gaitan-Espitia. During his study period at HKU, he was interested in investigating the phenotypic plasticity of marine phytoplankton to environmental changes and stressors, aiming to understand better the ecological dynamics of primary producers under interactive drivers and the underlying mechanisms.

Abstract:

The marine environment is characterized by high spatiotemporal variability in abiotic conditions, significantly influencing the physiology, ecology, and evolution of marine life. Microscopic phytoplankton organisms, which reside in this dynamic environment, play a crucial role as primary producers, mediators of biogeochemical cycles, and the foundation of the food webs. For these organisms, changes in natural environmental (e.g., light, temperature, and nutrients) and anthropogenic (e.g., pharmaceutical pollutants) factors, govern their ecological dynamics and functions. To cope with stressful short-term scale (within a few generations) changes in these drivers, phytoplankton adjust their physiology and morphology through phenotypic plasticity. Although our understanding of the physiological and ecological responses of phytoplankton to single drivers (e.g., thermal plasticity in response to temperature change) has advanced, significant knowledge gaps persist in the mechanistic understanding of the interactive effects of multiple drivers. In this context, this thesis investigates the interplay between environmental drivers on the phenotypic plasticity of marine phytoplankton and elucidates the underlying mechanisms. For instance, I uncovered the regulatory role of light availability on thermal plasticity in phytoplankton by demonstrating shifts in their thermal performance curves (TPC). Additionally, I revealed that the pharmaceutical pollutant fluoxetine interacts antagonistically with temperature, altering thermal plasticity in two diatom species. The critical role of nitrogen availability in shaping population dynamics is also highlighted by examining the growth response of a diatom species under different nitrogen sources. Furthermore, I delved deeper into the molecular underpinnings of the interactions between fluoxetine and temperature through gene expression analysis, which revealed the dominant regulatory role of temperature in key molecular pathways.

Overall, this thesis provides a comprehensive understanding of the phenotypic plasticity of phytoplankton under the influence of interacting natural and anthropogenic-mediated environmental factors. The findings contribute to a better understanding of the ecological dynamics of phytoplankton under interactive drivers and the underlying molecular mechanisms, emphasizing the importance of studying the consequences of multiple environmental variations on the population dynamics and ecological functions of marine phytoplankton in the face of a changing climate and increasing anthropogenic pressures.

--- ALL ARE WELCOME ---