The University of Hong Kong
School of Biological Sciences

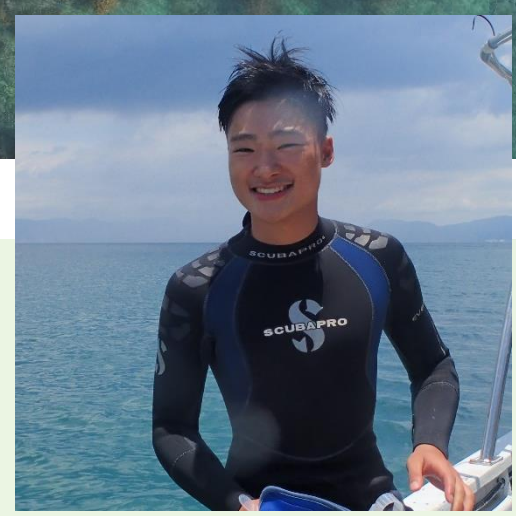
Public Seminar

Physiological responses and ecosystem functions of key primary producer under local and global changes

Date: Jan 12th, 2022 (Wed)

Time: 10:00 am

Venue: Rm 6N-11, KBSB



About the speaker:

CHEUNG Wai Yin is a PhD student in the Marine Futures Lab (Dr. Bayden Russell). He is an algae-enthusiast and has always been fascinated by the ecological interactions between macroalgae and its surrounding environment.

Abstract:

Ocean warming and acidification have altered the physical and chemical properties of marine environments by increasing ocean heat budget and lowering pH. As a result of these rapid changes, the distribution and phenology of marine producers are experiencing significant impacts—establishing baseline and mechanistic understanding behind these shifts allow for future assessment of systemic changes in ecosystems.

Transition zones between tropical and temperate regions, such as the South China Sea in which Hong Kong is located, are characterized by large seasonal variability which affects algal phenology. Seasonal field surveys revealed that temperature negatively correlate with the proliferation of subtidal macroalgae in Hong Kong, especially *Sargassum hemiphyllum*, emulating the phenology of *Sargassum* forests in similar ecoregions, contrasting the barren rocky substrates defined by encrusting algae and rock oysters during summer. Aerial drones equipped with high resolution cameras combined with deep learning to differentiate macroalgae from its environment are a potential replacement for field-based macroalgal surveys but are yet unproven. I used drone surveys and deep learning (AI) combined with ground-truth sampling of biomass, to increase the sampling extent and accuracy. Importantly, such monitoring systems may allow us to link local population productivity to regional patterns.

The effect of temperature and irradiance on the productivity and growth of *S. hemiphyllum* was examined. Macroalgae in the rapid growth stage were limited by warm temperatures, however, their photosynthetic performance peaked in the same temperature range when growing in drastically different form, suggesting a dimorphic adaptation to counter thermal stress, which may come at the expense of shortened growth season and overall lower productivity. Algal biomass will eventually enter detrital pathways mediated by microbes, which are sensitive to pH shifts. I tested how ocean acidification changes microbial community composition and diversity and, subsequently, their degradation of algal detritus. My experiment revealed that increased microbial diversity near submarine CO_2 vents and enhanced degradation rate, suggesting that restructuring of acidified microbial communities may reflect quicker carbon recycling in future oceans, limiting the sequestration capacity of macroalgal forests through biomass exportation.

As climate change alters the marine environment, physiological and ecological processes of macroalgal-dominated communities will change. However, since interactions between biotic and abiotic factors are complex, the resultant consequences may not always be straightforward. Here, I provided valuable insights on the mechanistic changes in a subtropical macroalgal-dominated biota, thus improving our understand on their functional shifts in the face of climate change.

ALL ARE WELLCOME