The University of Hong Kong
School of Biological Sciences

Public Seminar

Impacts of seasonality on a key benthic grazer and its role in ecosystem function

Date: 18 May 2022

Time: 09:00

Venue: Zoom

About the speaker:

Jake Dytnerski is a PhD candidate in Dr. Bayden Russell's Marine Futures Lab and is co-supervised by Dr. David Baker. He is an avid diver and hopes his research and future work can have a positive impact on sustaining a healthy ocean.

Abstract:

Seasonal variation impacts all aspects of ecosystems including temperature, nutrient availability, and photoperiod, influencing everything from individual physiology to community-wide food availability. Hong Kong experiences large seasonal variations in marine environmental conditions, especially seawater temperature and algal biomass, but little is known about how this seasonality affects benthic marine herbivores. For my PhD, I investigated the effects of seasonality on a key subtidal herbivore, the long-spined sea urchin, *Diadema setosum*, and how its role within the ecosystem changes with fluctuating environmental conditions. I used feeding assays to determine preference, grazing rate, and the effects algal diet on urchin growth and found that the urchins preferred *Sargassum hemiphyllum* when presented with multiple algae species, which coincided with increased growth rates. I then tested if urchins would increase their energy stores in food-replete winter, for the food-limited, energetically demanding summer. Contrary to predictions, total energy stores did not differ seasonally. Yet, metabolic rates quadrupled in summer while grazing rates only doubled, suggesting lower winter metabolic rates may limit feeding activity. I then tested if *D. setosum* alter their fatty acid profiles in winter to increase membrane fluidity and maintain function. Surprisingly, I found that urchin have decreased lipid fluidity in winter, possibly as a response to oxidative stress. However, urchins in temperature-controlled laboratory experiments did not change fatty acid profiles, meaning that oxidative stress was caused by more than cold temperatures. Lastly, I tested how urchins maintain coral communities in Hong Kong by experimentally excluding them for 13 months and assessed the effects of algal settlement, sediment accumulation, bioerosion, coral growth and survival on three abundant coral species. I found that urchins were particularly beneficial to two of the three species in winter, when corals were potentially cold stressed, and algal growth and sedimentation rates were high.