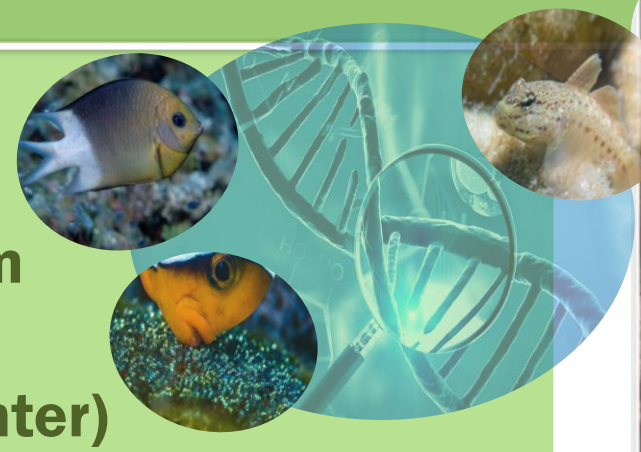
The University of Hong Kong
School of Biological Sciences

Public Seminar

Transcriptional Plasticity and Environmental Change in Marine Fishes



Date: 15 April 2024
Time: 14:00
Venue: KBSB 6N-11 & Zoom
Speaker: Sneha Suresh
(Supervisor: Dr. Celia Schunter)

Abstract:

How organisms respond to environmental changes is crucial for their survival, especially in the face of rapid climate change. One of the mechanisms facilitating acclimation to novel environments is phenotypic plasticity. Plastic responses are influenced by various factors like environmental stability, parental experiences, and genetic factors and can be classified as acute, developmental, or transgenerational responses based on the timeframe involved. This dissertation investigates molecular basis of all these three types of plasticity in marine fishes in response to changes in their physical and social environment. Physical environmental changes mediated by ocean acidification (OA) negatively affects various fish species however, some thrive in naturally occurring CO2 seeps. We show that the ability of anemone gobies, to survive and thrive in the CO2 seeps in Vulcano Island, Italy, is potentially mediated by developmental plasticity. The stability of CO2 concentration was also found to be crucial. Exposure of spiny damselfish to both stable and fluctuating CO2 conditions resulted in loss of natural rhythmic splicing events however, fish in fluctuating CO2 conditions alone showed increased capability of time-dependent regulation of splicing events in genes associated with synaptic plasticity and neuronal functioning. Furthermore, the spiny damselfish showed molecular signatures of intergenerational plasticity to OA, particularly in the brain and liver. Interestingly, these signatures were predominant in offspring of parents behaviourally tolerant to OA. This shows that parental phenotype and parental environment play a role in mediating offspring transcriptional response to OA. An organisms' environment encompasses not only its physical environment but also the social environment. The last chapter of this thesis explores molecular processes underlying plastic responses of organisms to changes in their social environment by using the anemone-anemonefish mutualistic system. Significant changes in the transcriptome of both species were identified during the acclimation period of mutualistic association. This study reveals an interplay of molecular events underlying mutualistic association in both partners. Taken together, the findings reported in this thesis furthers our understanding of the molecular processes underlying various types of phenotypic plastic responses to environmental changes and provides key information regarding the acclimation potential of marine fishes to global change.