Background:

- Marine heatwaves (MHWs) are anomalous warming events above the regional seasonal 90th percentile for 5 or more days.
- By affecting species interactions, MHWs have the ability to drive trophic alterations, such as through top-down (grazer to 1st producer) and bottom-up (1st producer to grazer) and indirect effects in seagrass meadows.
- However, there is little empirical testing of MHW impacts on multiple levels of organisation in seagrass meadows and in different seasons.

Research Questions
1) How does the seagrass *H. ovalis* physiologically respond to summer and winter MHWs?
2) Does this affect the seagrass’ nutrient content and the growth of epiphytes?
3) How are grazers affected by a MHW and is this driven by top-down or bottom-up alterations?

Methods:

- 1. Collection
  - *H. ovalis* and *B. zonalis* were collected from Tung Chung Bay (N22°17.10’E113°55.60’).
  - Seagrass was planted into 20 tanks and exposed to control or MHW temperature for 10 days. Grazers were added to half of the tanks.
  - Experiment carried out in two seasons: summer 2022 and winter 2023.

Measurements:
- Seagrass growth, biomass, C and N content and stable isotope signatures.
- Epiphyte biomass.
- Grazer biomass, grazing rate.

Results:

- Separate statistical analyses were performed for each season and response variable. Letters indicate significant differences for each season (in different colours).
- There was a strong interactive effect of temperature, with grazer presence. No increased growth was observed at control temperature, with grazer presence. No increased growth was observed at control temperature, with grazer presence. No increased growth was observed at control temperature, with grazer presence. No increased growth was observed at control temperature, with grazer presence.

Conclusion:

- From this study, we see that the season in which the marine heatwave occurs, as well as the heatwave itself, can affect the strength of species interactions. In winter, increased temperature (driven by the MHW) had strong positive effects on seagrass growth and the growth of epiphytic algae. However, the change in temperature did not affect grazers or their ability to elicit strong top-down trophic responses. In summer, the increased temperature did not drive changes to seagrass growth as in winter, however the presence of grazers boosted the seagrass growth under ambient temperature conditions. For epiphytic algae growth, patterns were similar between seasons, but there was a stronger interaction in summer between grazer presence and increased temperature leading to decreased epiphyte growth. This correlated with increased snail biomass and slight increases in grazing rate. For future projects, I hope to examine whether shifts in trophic interactions are driven by fine-scale processes, such as microbiome shifts.

References


Aknowledgements

Thank you to the Agricultural, Fisheries and Conservation Department for their approval of the seagrass collection and this project. Thank you also to the Stable Isotope Laboratory at HKU for elemental and stable isotope analysis.

Thank you to my supervisors Prof. Laura Falkenberg and Prof. Haiwei Luo for their guidance through the experiment and analysis, as well as my labmates for the field collections.

Contact

e-mail: alissabass@link.cuhk.edu.hk

address: Room 323 F.S. Li Marine Science Laboratory,

head: 323 (19), Hackett road, Kowloon

ORCID: 0000-0002-6809-3361