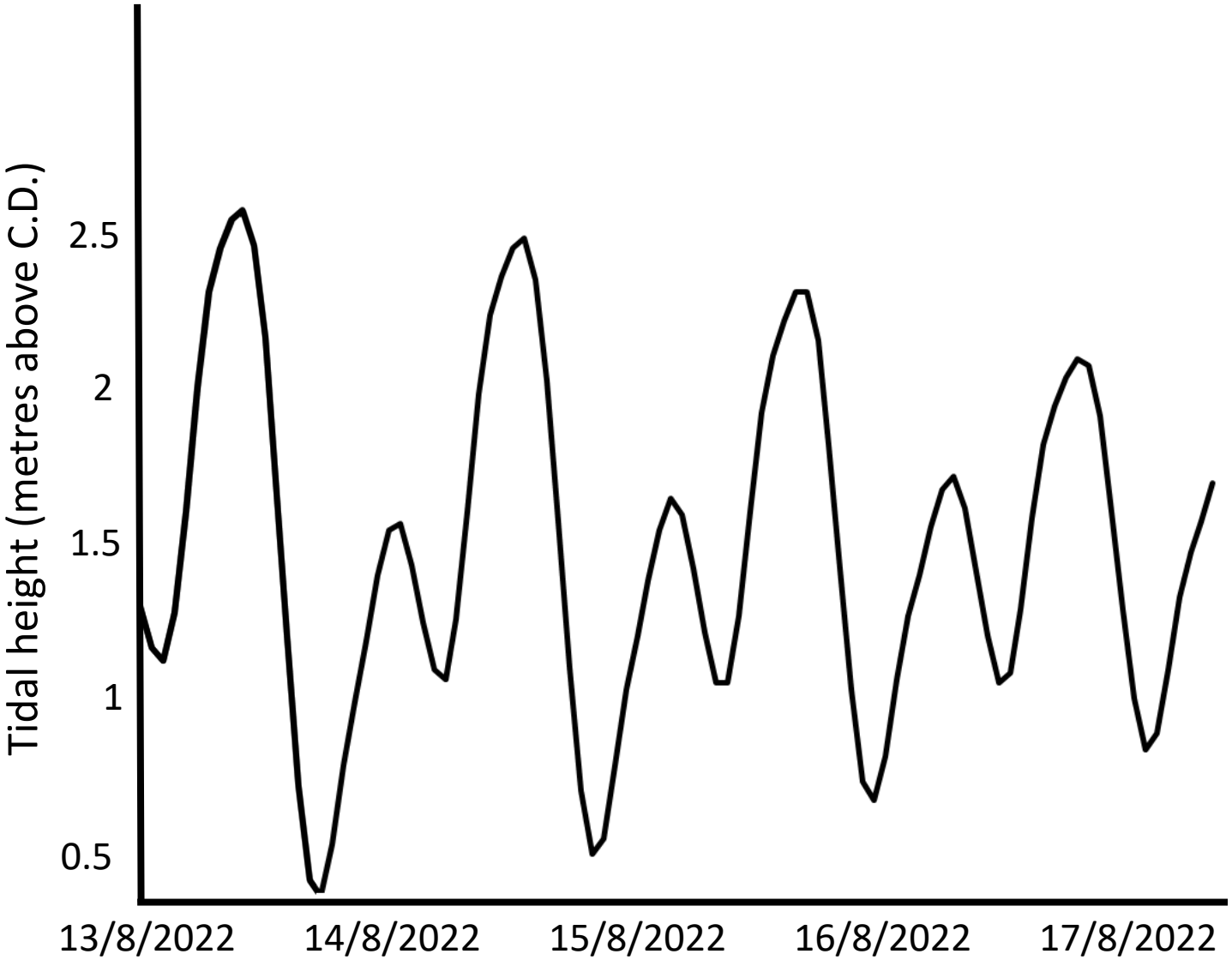
# Withstanding the stress

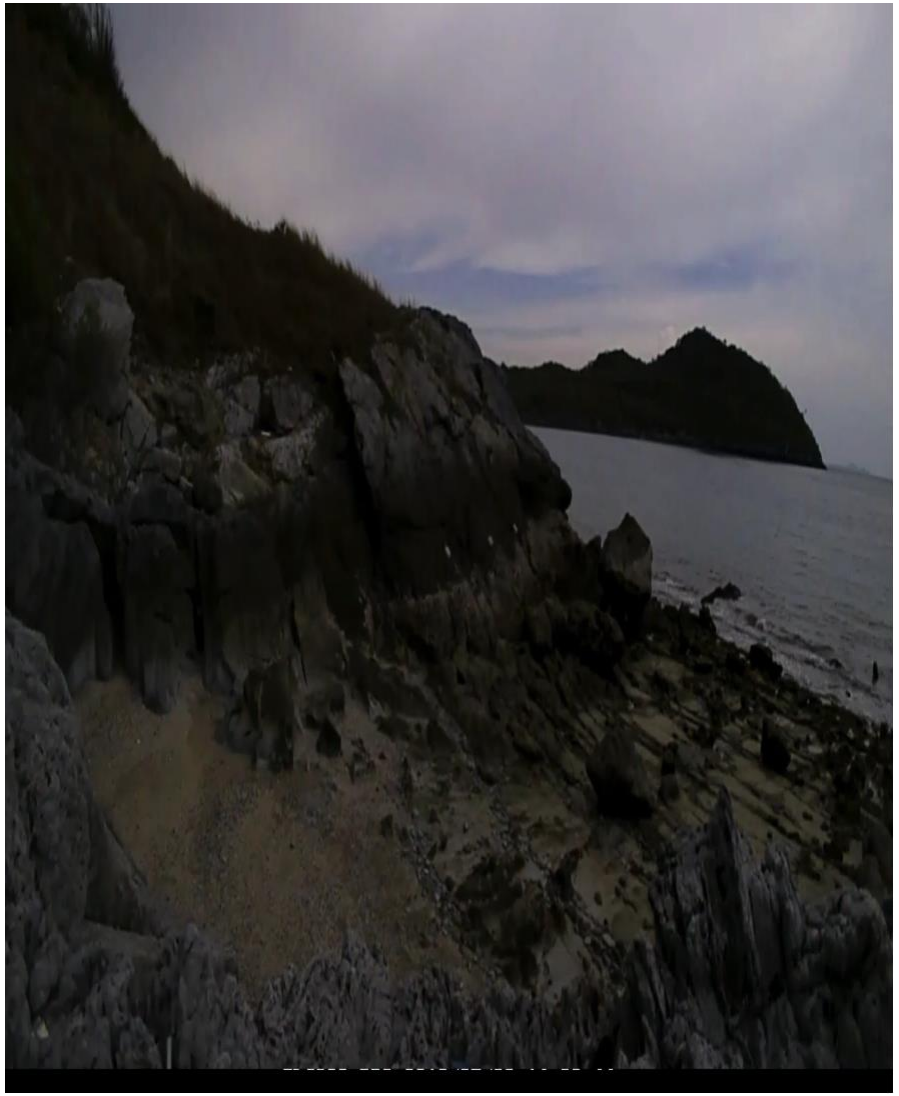
## behavioural and physiological strategies to survive emersion in tropical intertidal bivalves

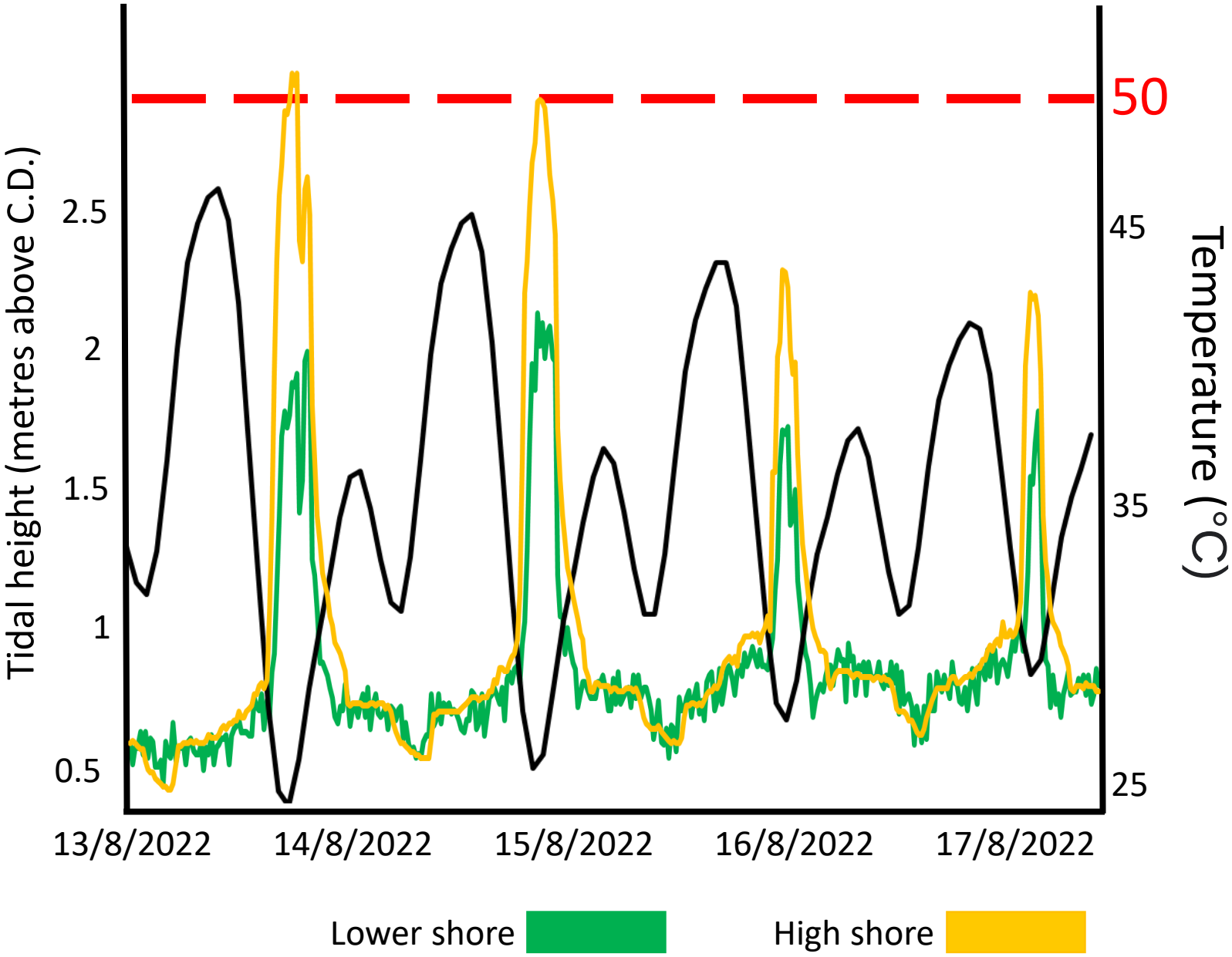
Benjamin, Chiu Sung-yau
Supervisor: Gray A. Williams

# Intertidal system - emersion



# Intertidal system - emersion



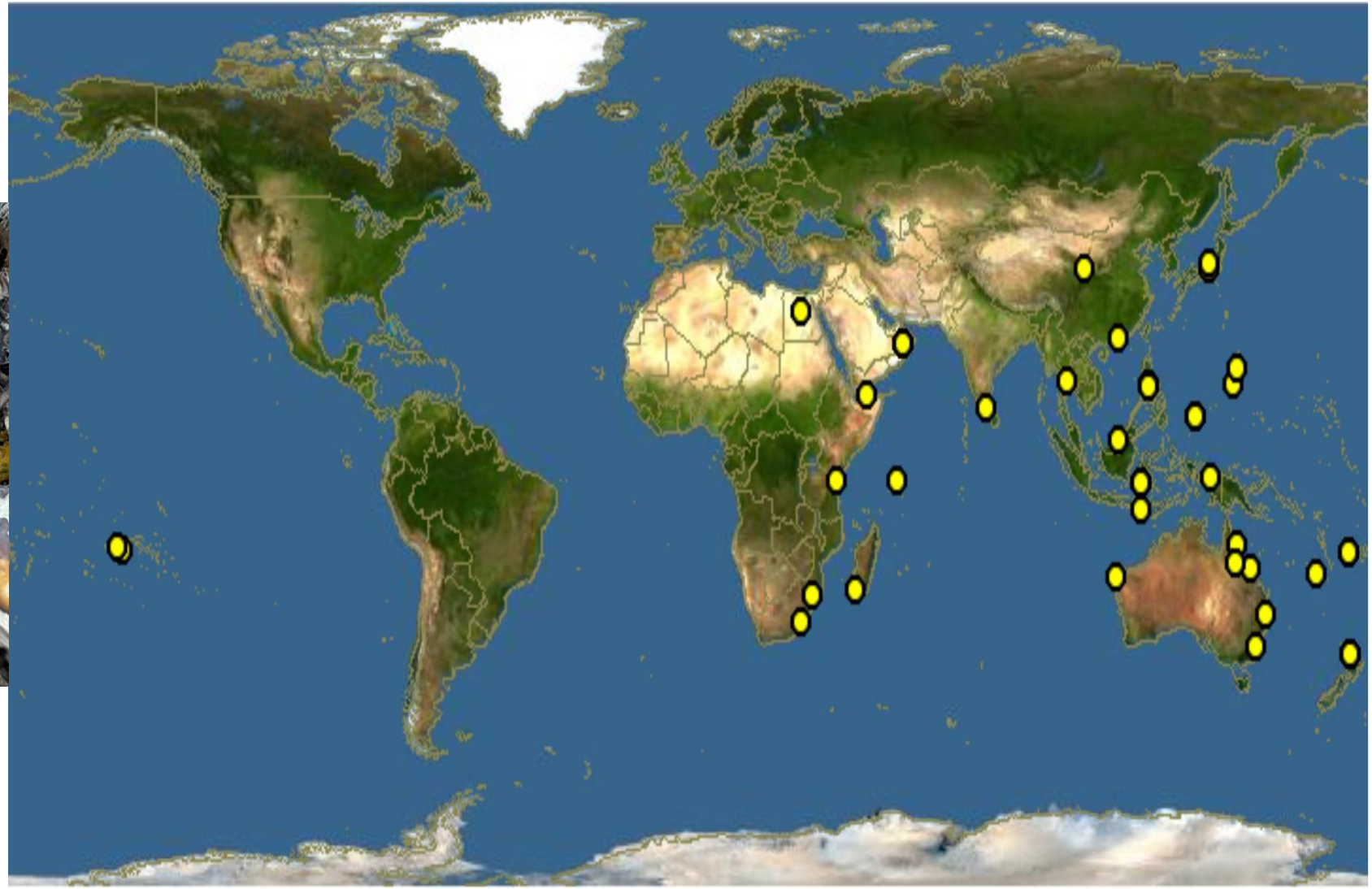


# Mortality by heat - tropical

Winter

Summer

# *Saccostrea cucullata*



Retrieved from DiscoverLife.org
https://www.discoverlife.org/mp/20q?search=Saccostrea+cucullata#http://biodiversity.org.au/afd/taxa/545b3ec0-1c15-4a28-9c88-8fa31dee6e57

# *Saccostrea cucullata*

(Chiu, 1997; Harper, 1997; McAfee et al., 2021)

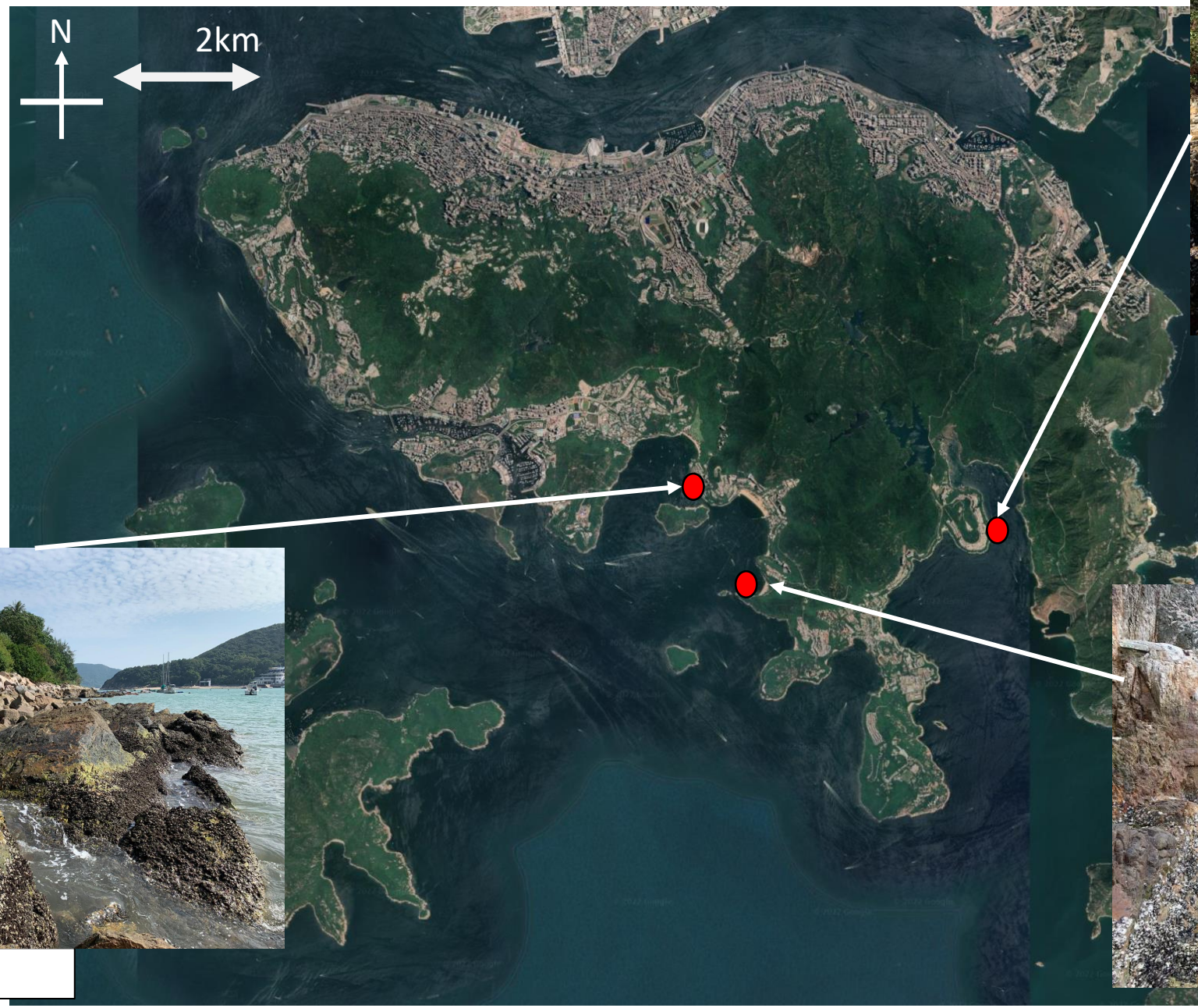
How exactly are *Saccostrea cucullata* doing so well in the tropics?

# How exactly are *Saccostrea cucullata* doing so well in the tropics?

- (1) What is the degree of heat and desiccation stress that *Saccostrea cucullata* are suffering during emersion?

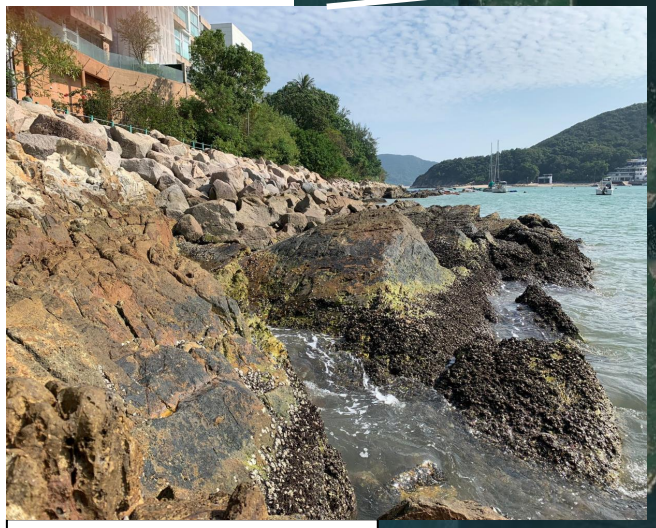
- (2) What is the thermal performance of *Saccostrea cucullata*? How does this relate to their thermal regime?

# Study sites



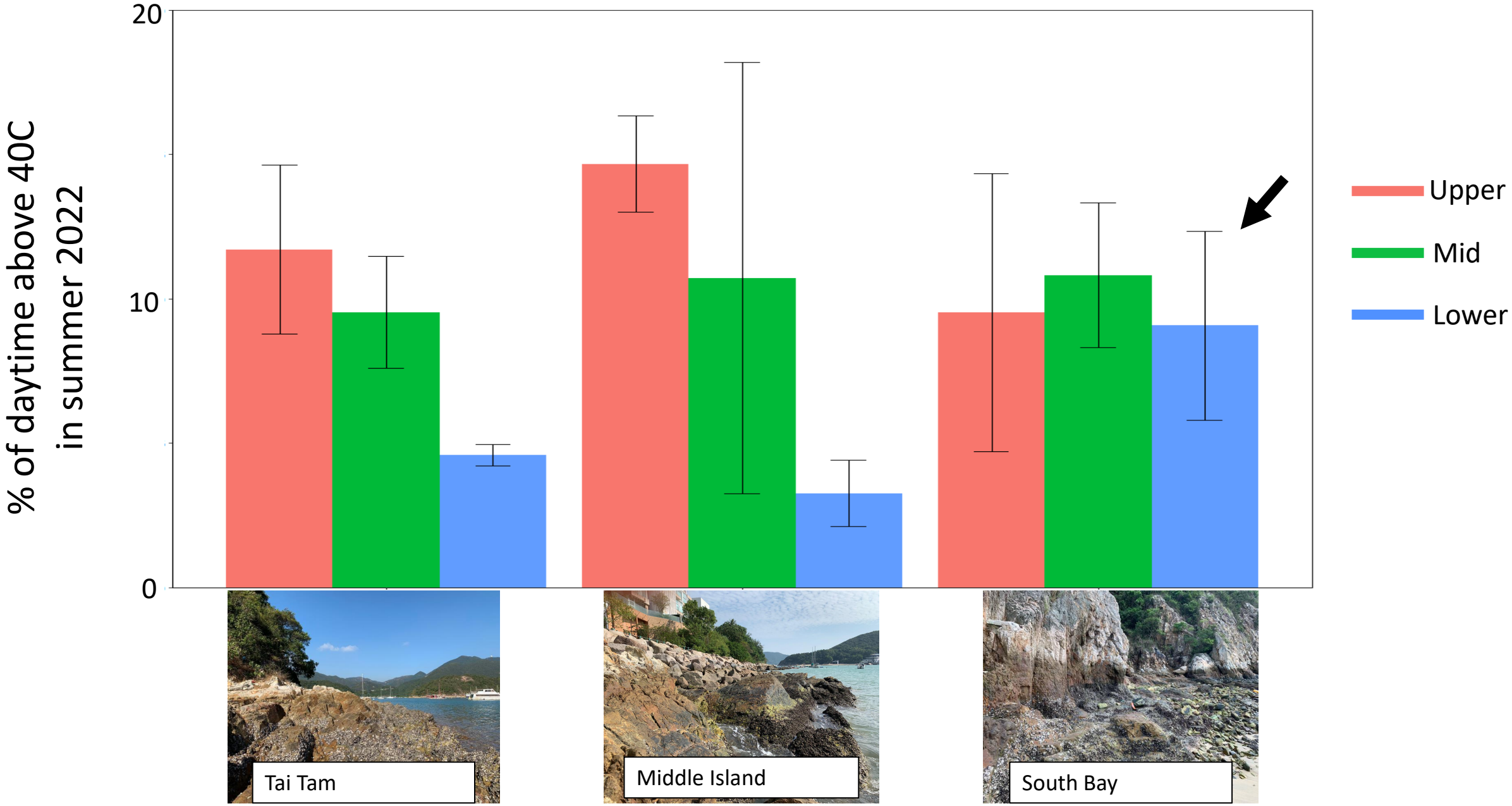

Tai Tam

South Bay

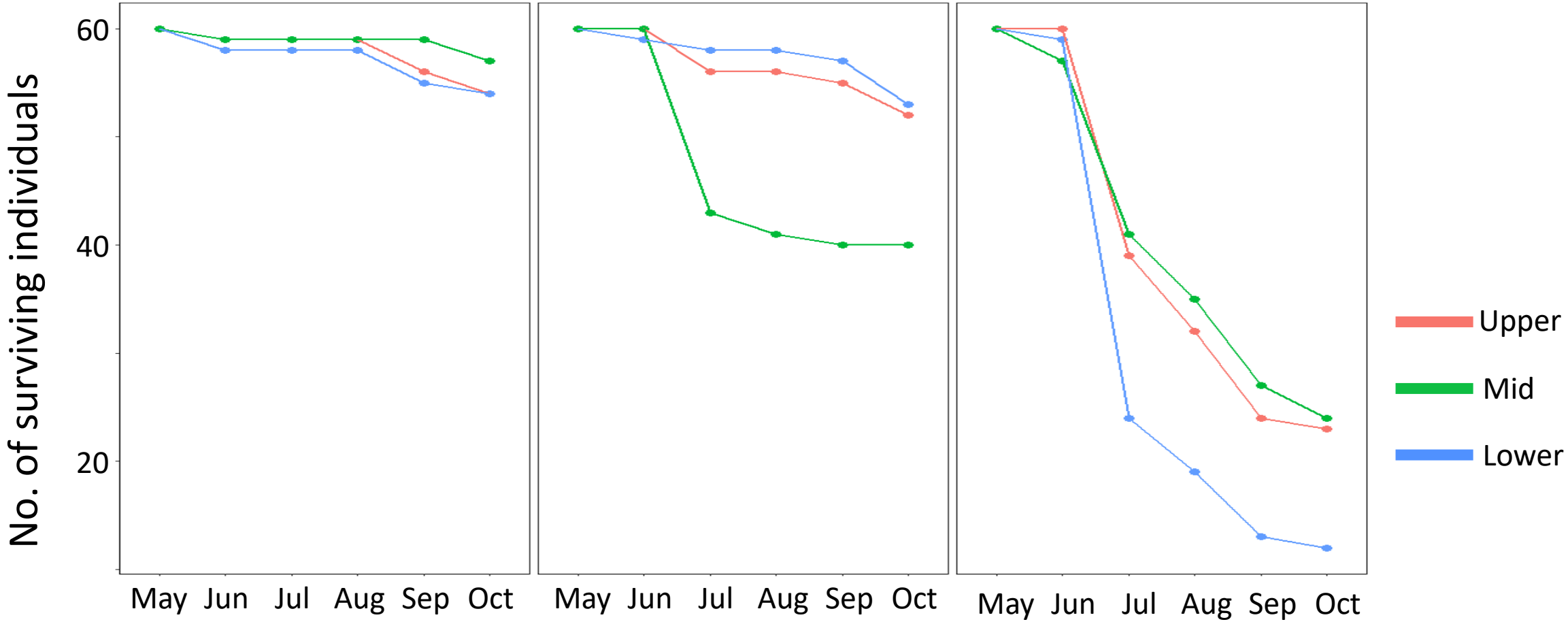


Middle Island

# Study sites - Temperature



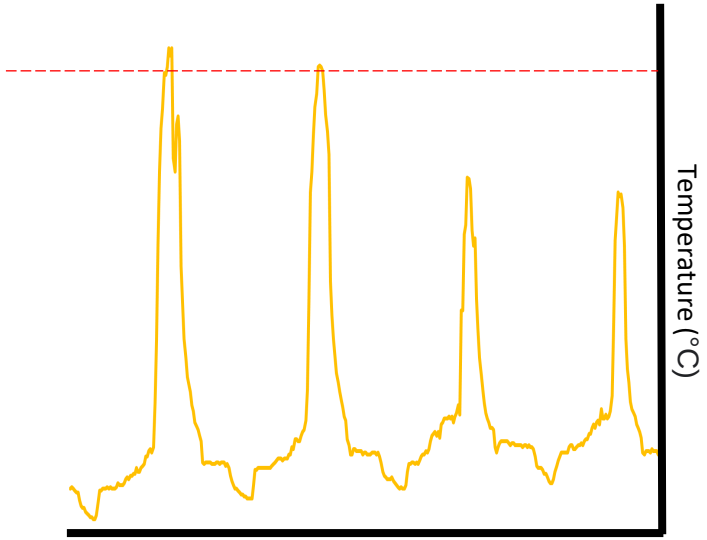
# Study site - Oyster mortality



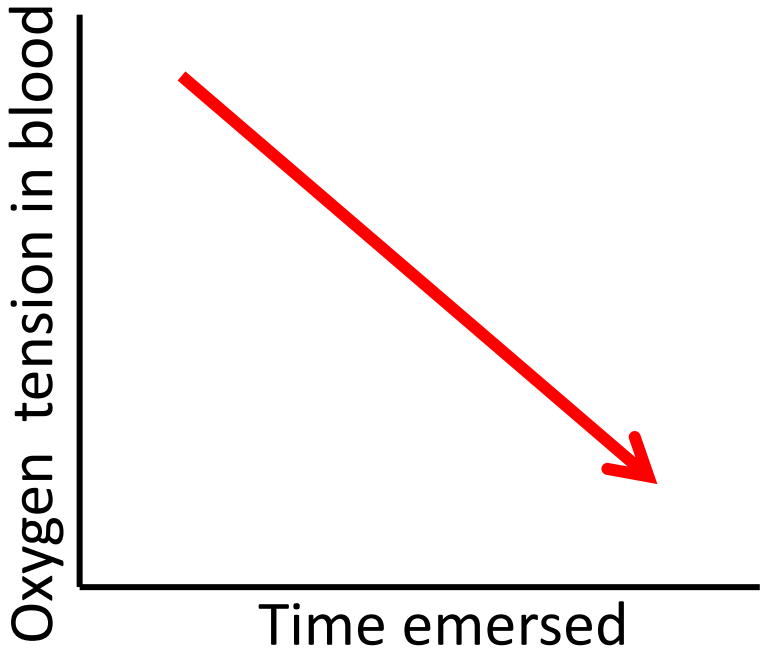


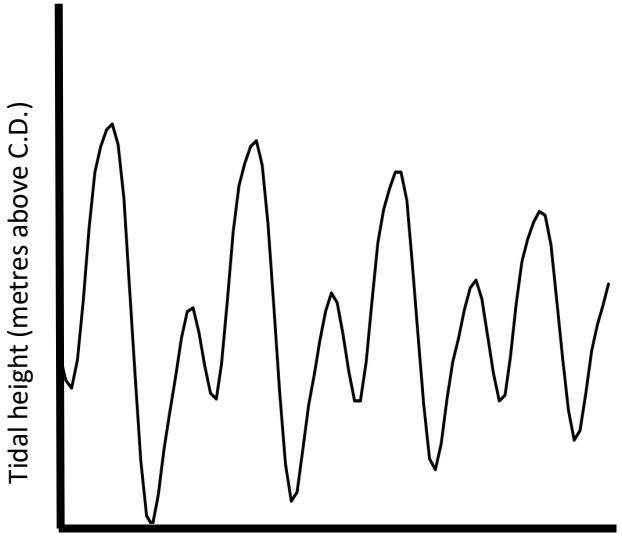

(1) What is the degree of heat and desiccation stress that *Saccostrea cucullata* are suffering during emersion?

# Expected result



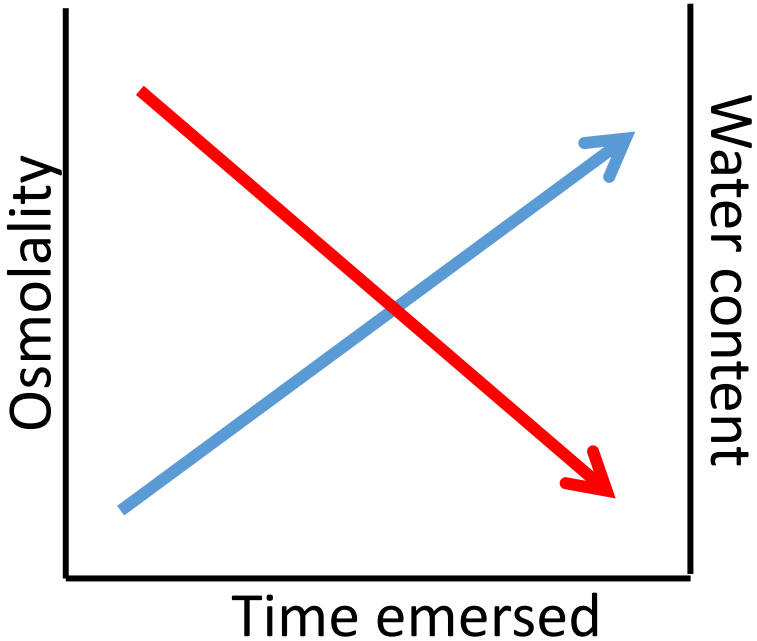

Oxygen availability



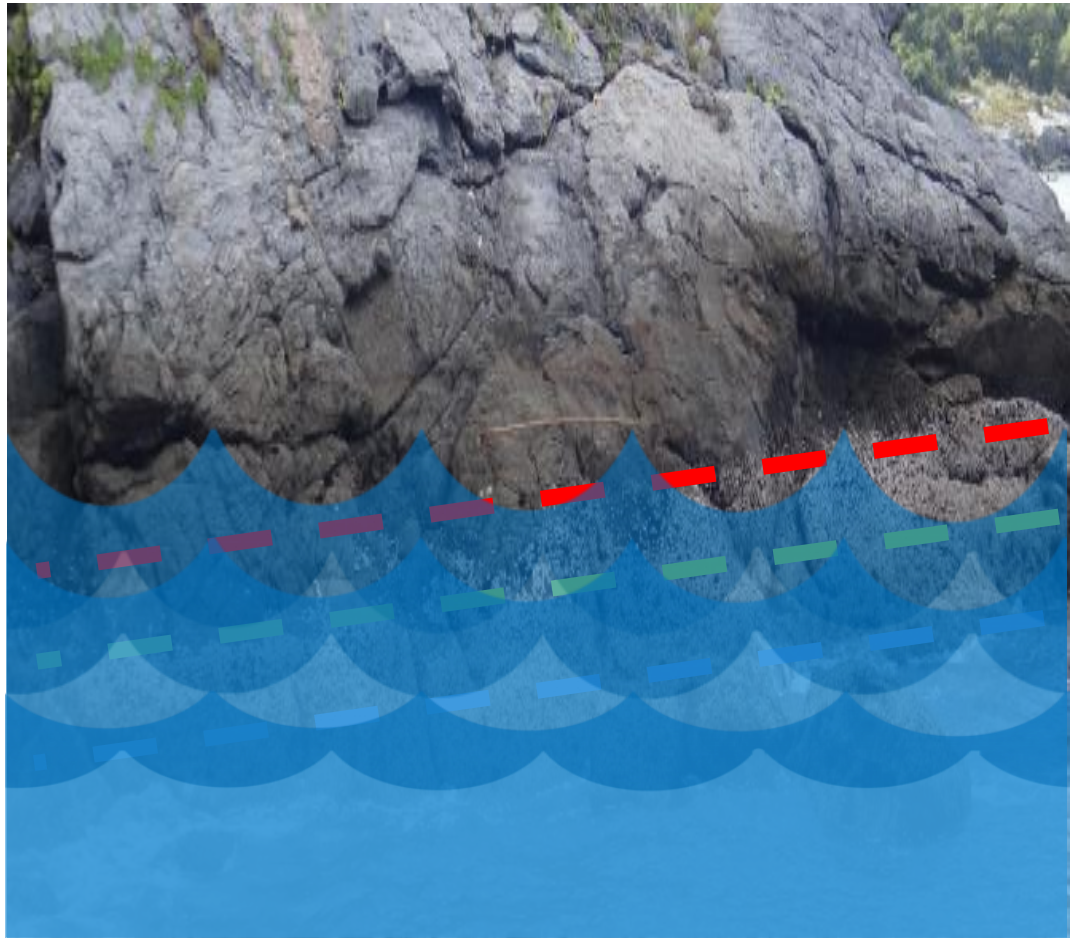



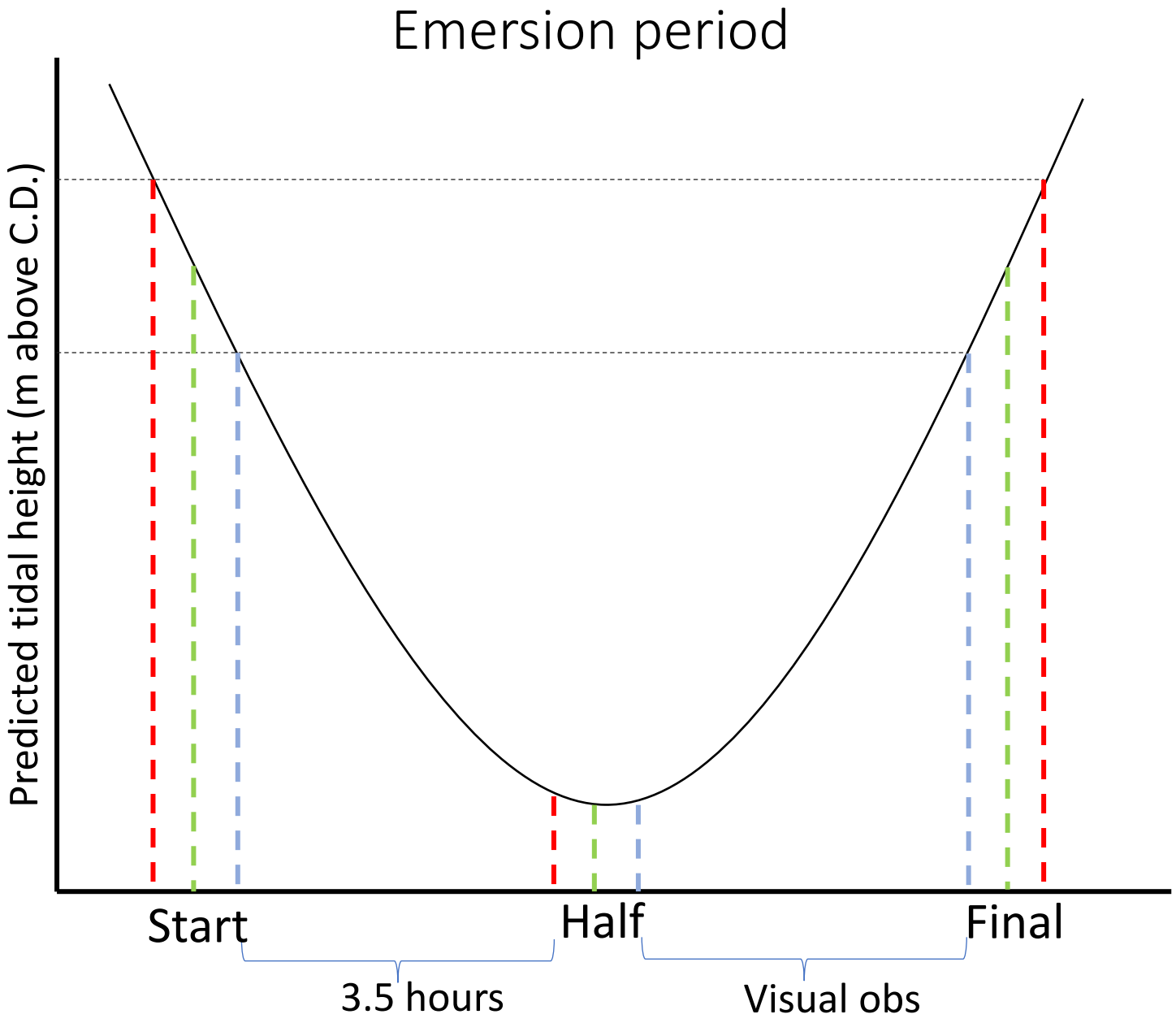

Osmotic stress

Water content



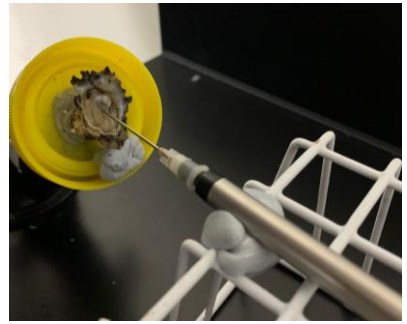
# Experimental design





# Experimental design

Haemolymph



Oxygen tension

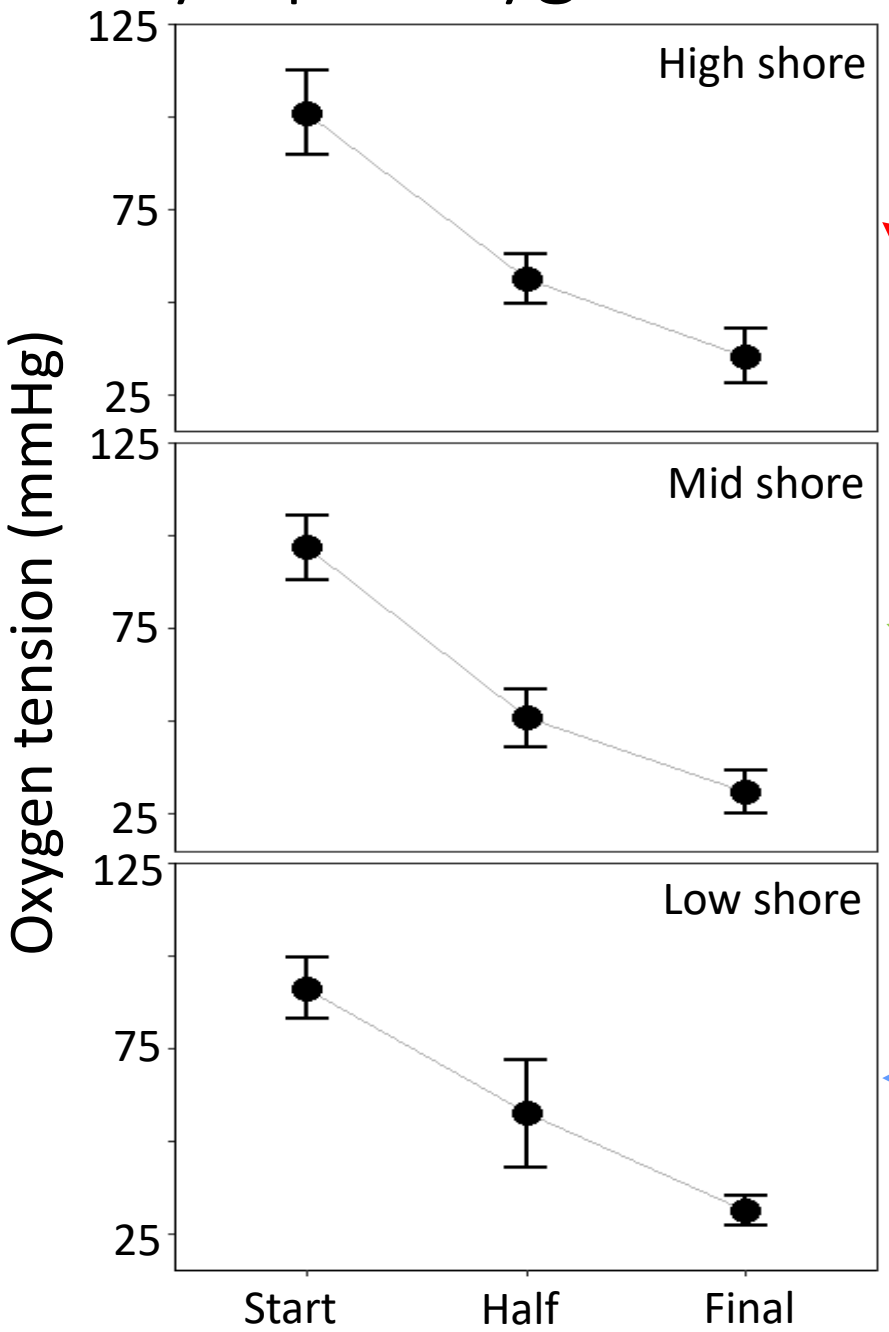
Mantle water

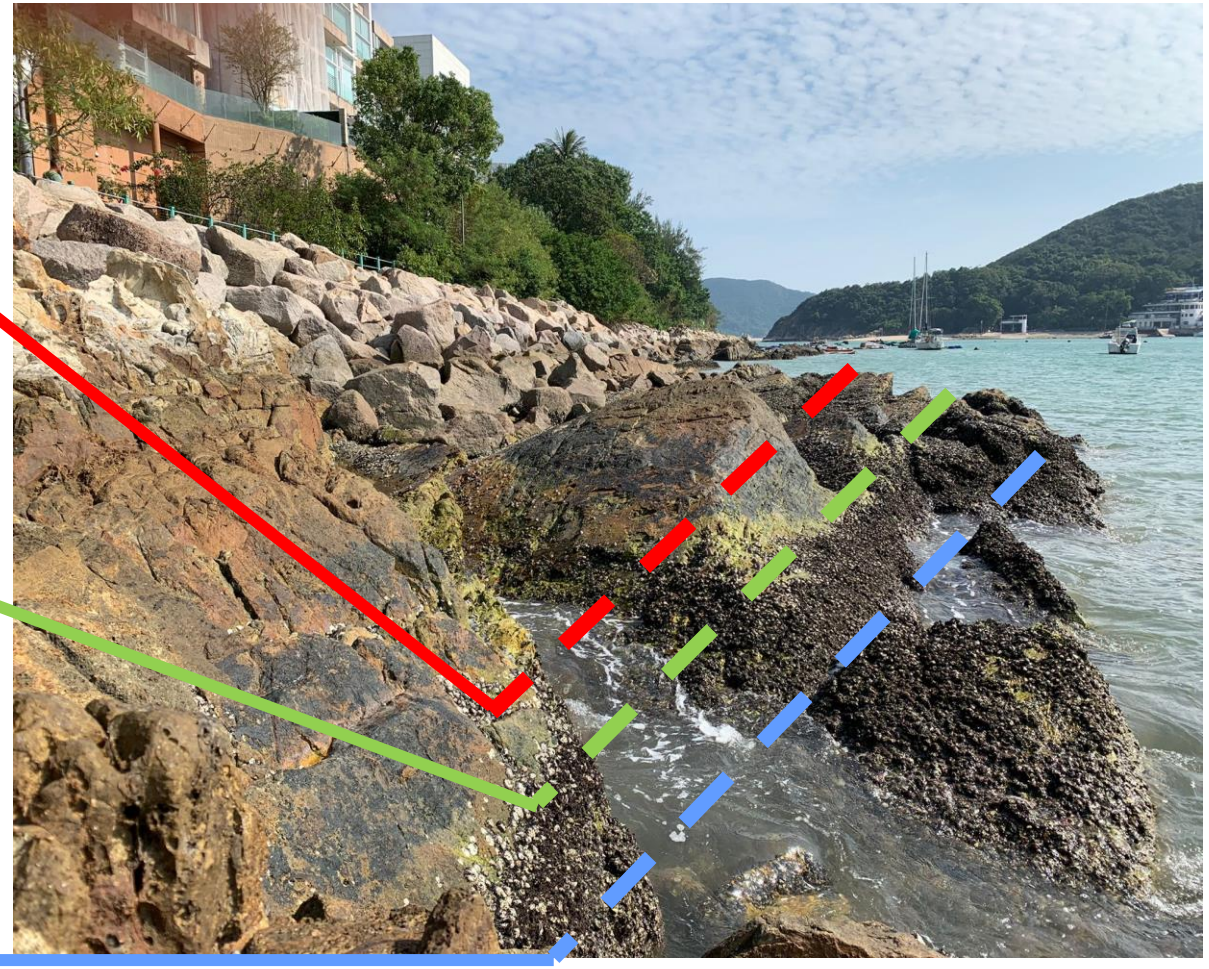
Osmolality

Flesh

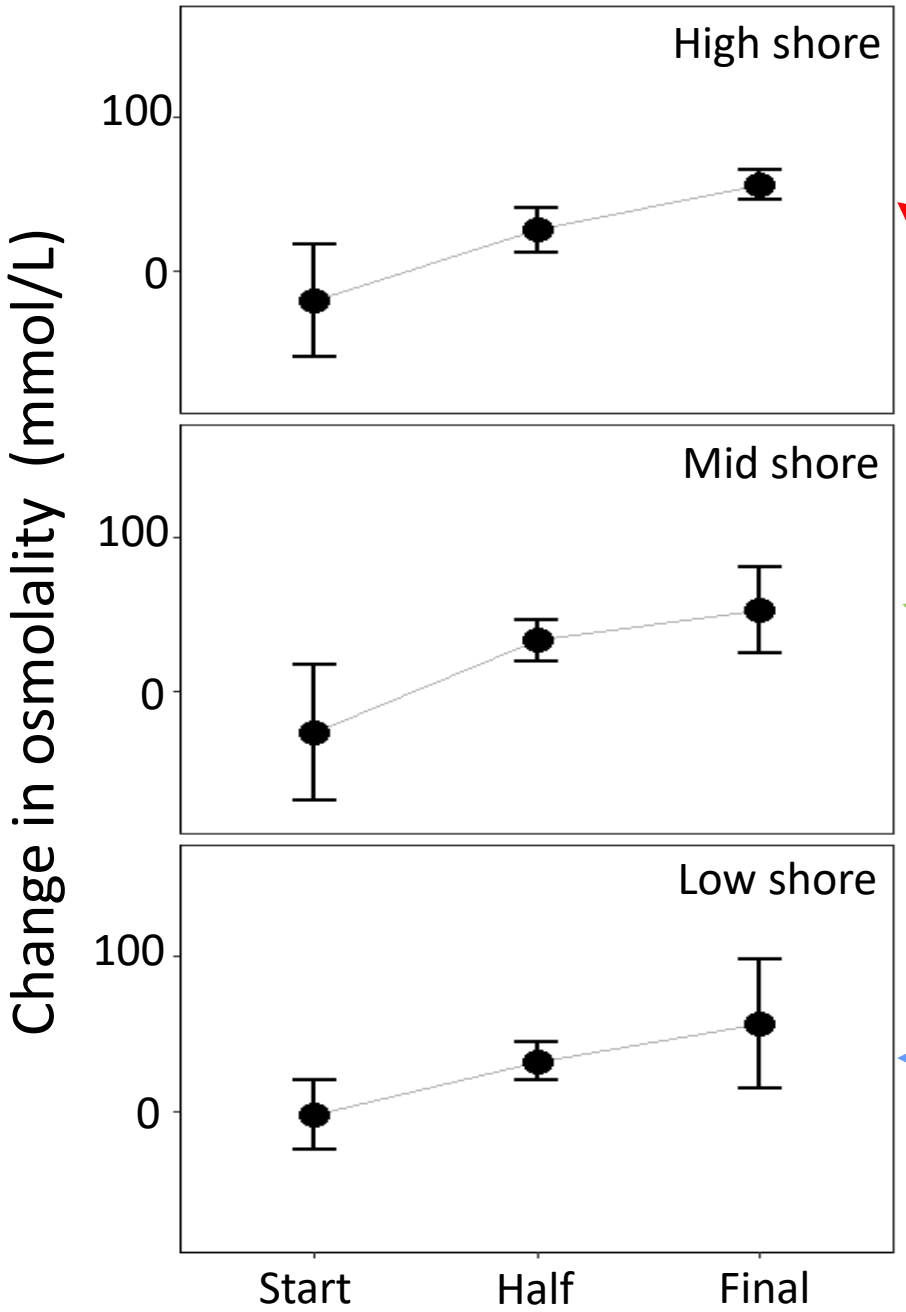
Dry weight

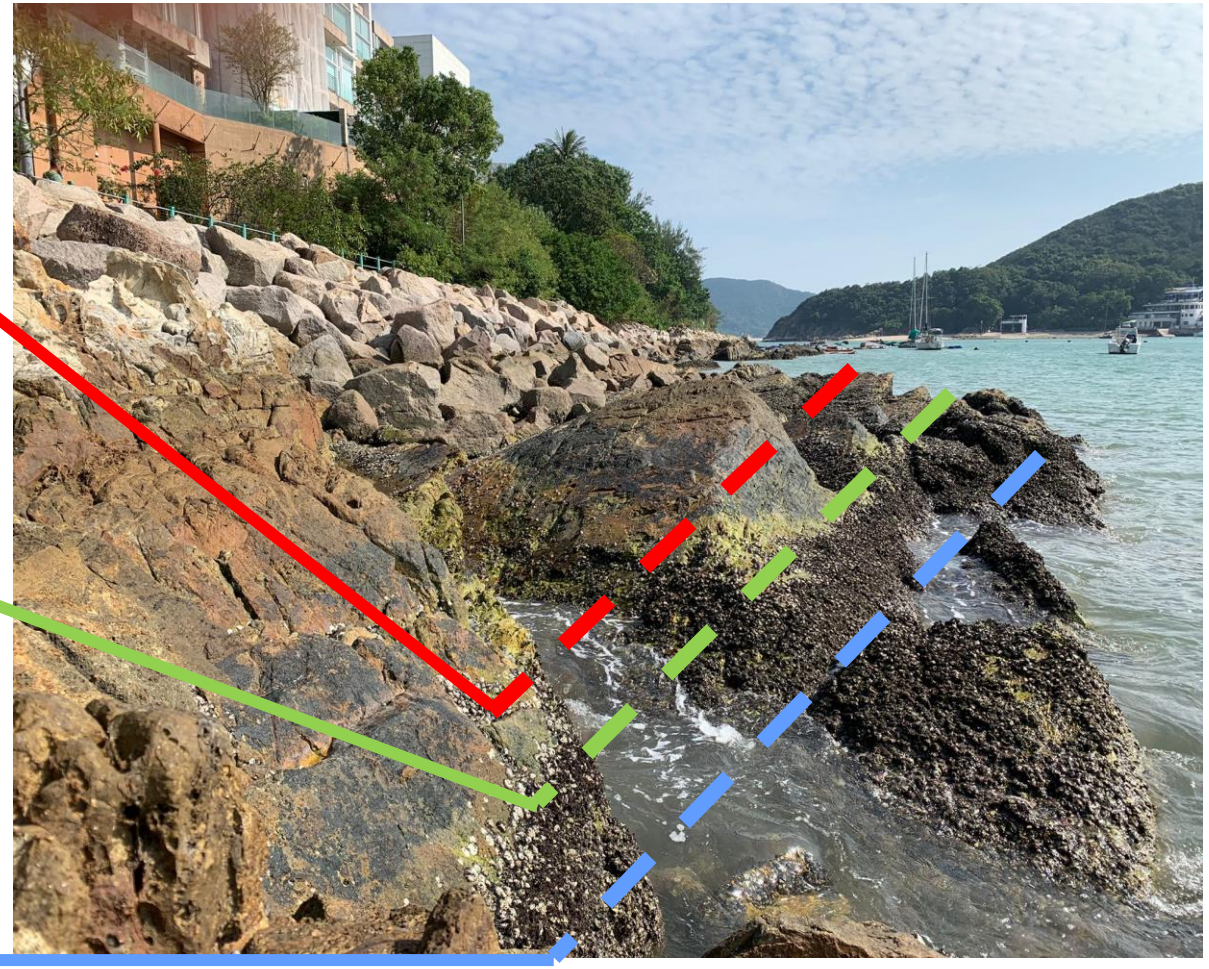
# Haemolymph oxygen tension



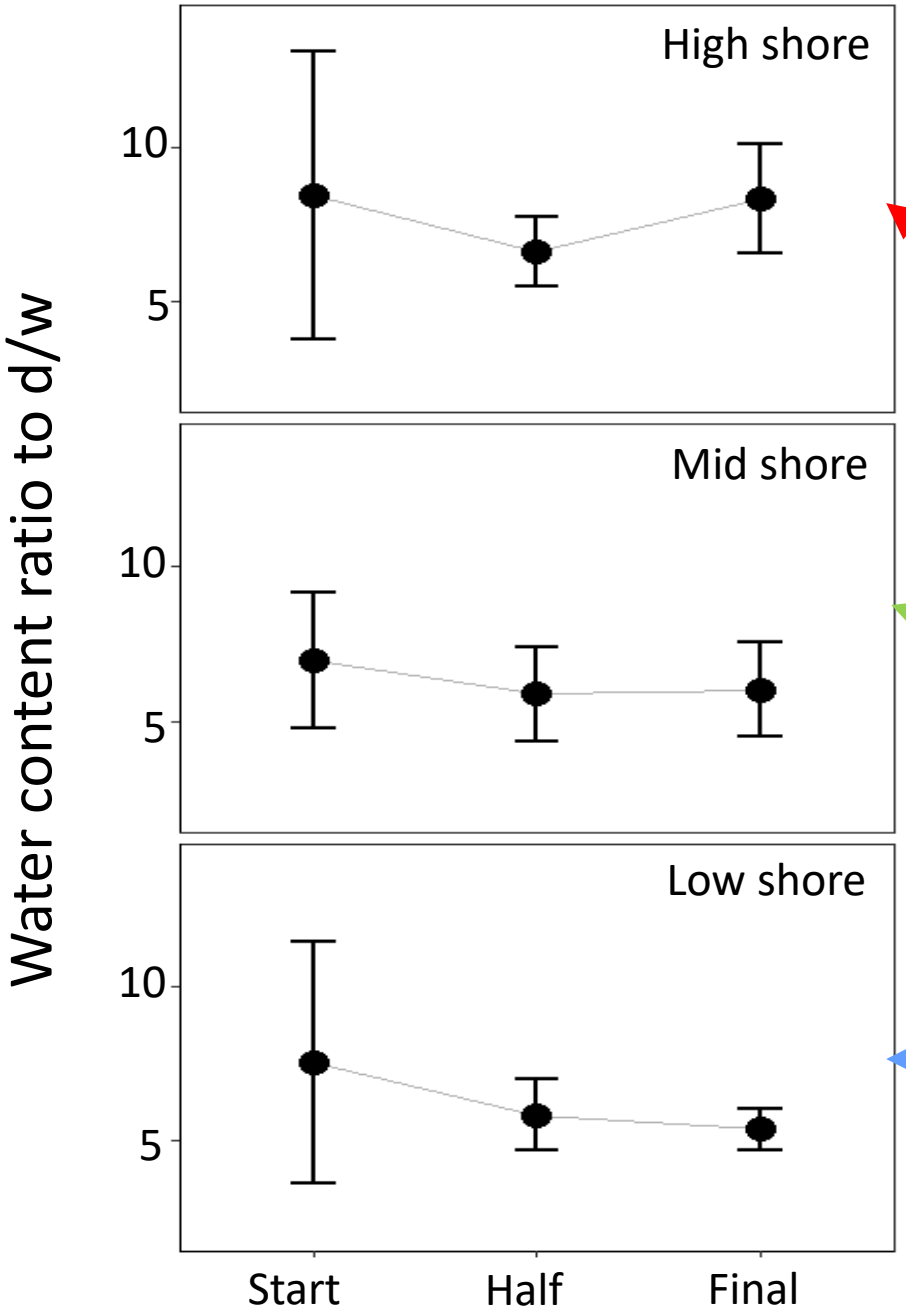



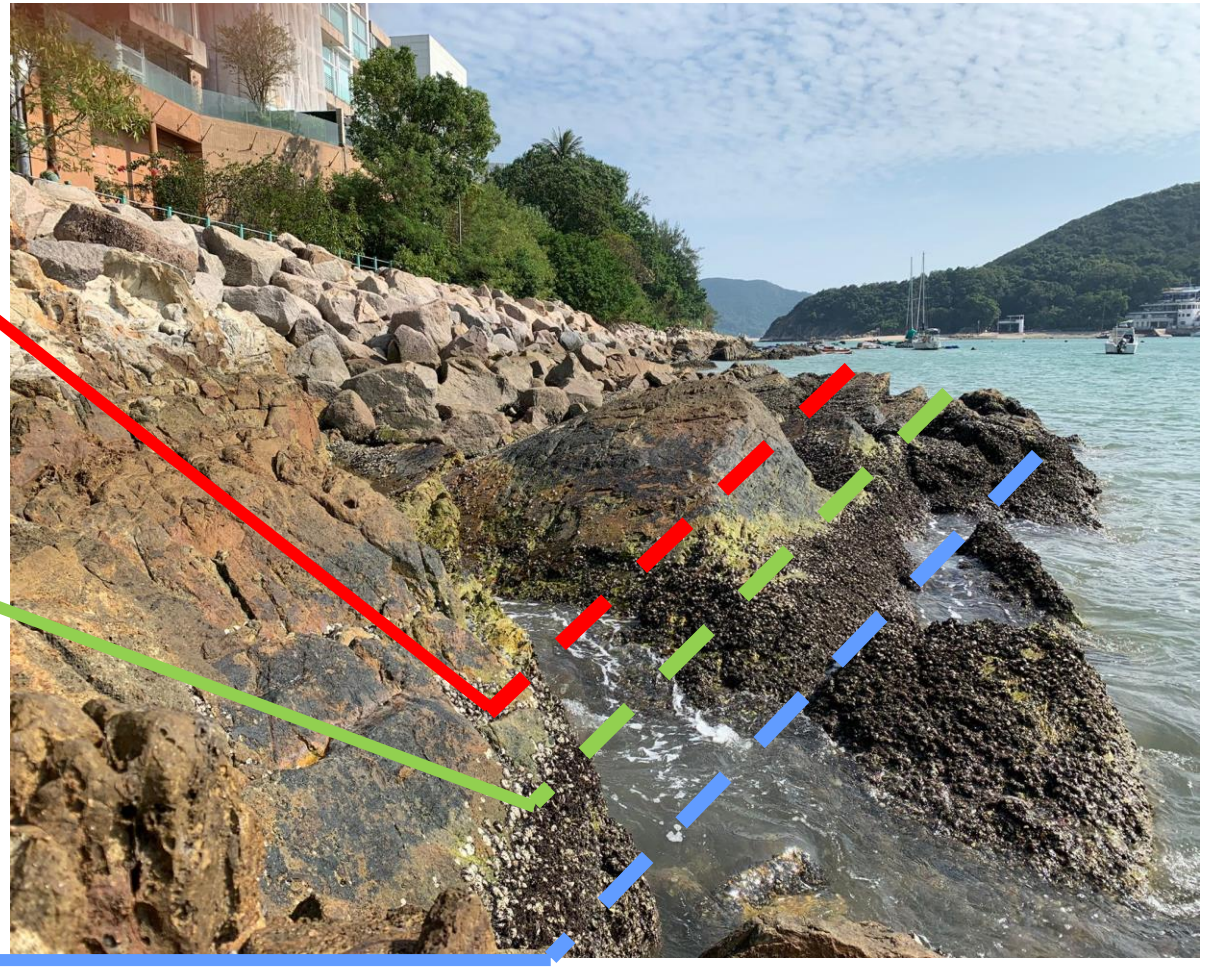
# Mantle water osmolality



# Water content ratio

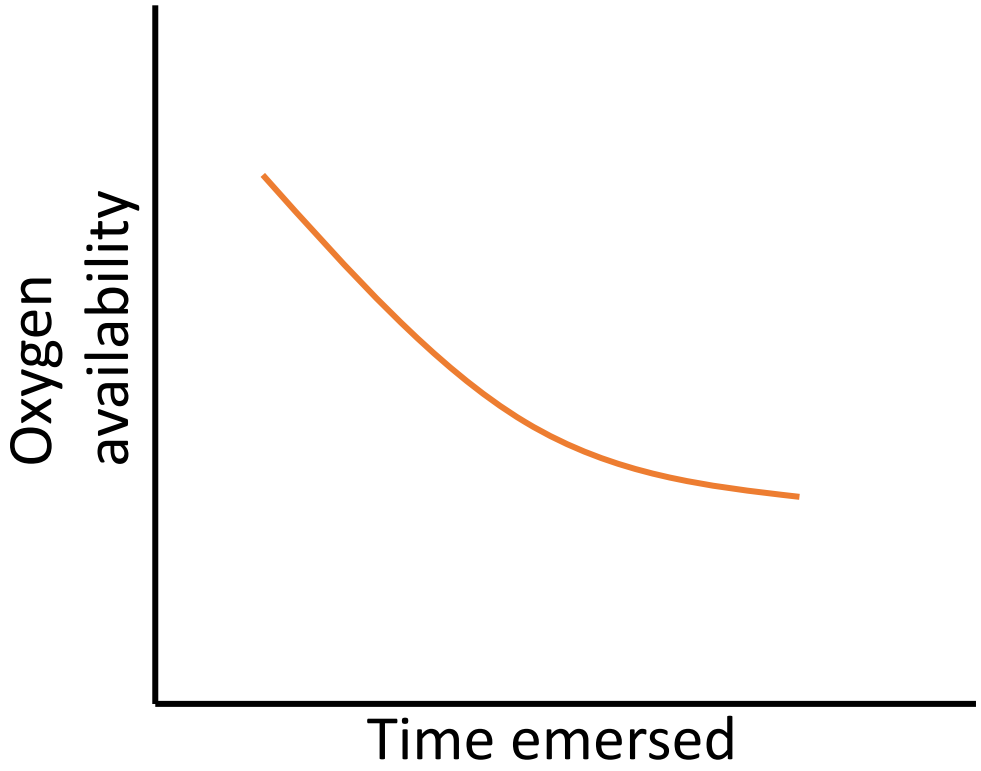


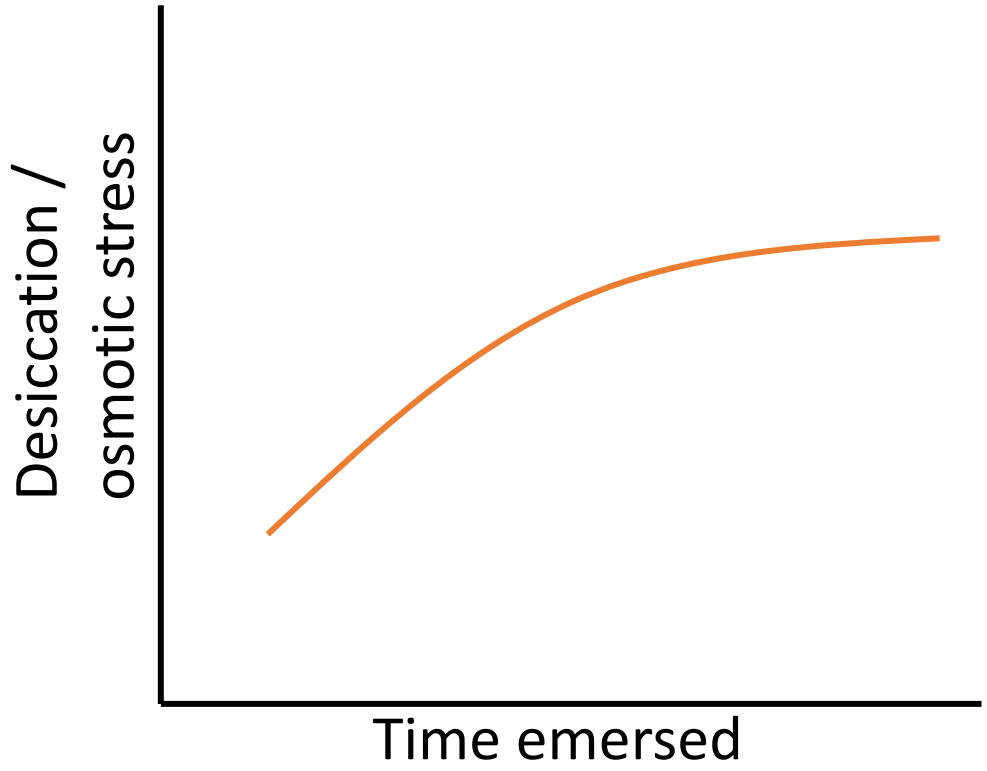



# (1) What is the degree of heat and desiccation stress that *Saccostrea cucullata* are suffering during emersion?

Summary

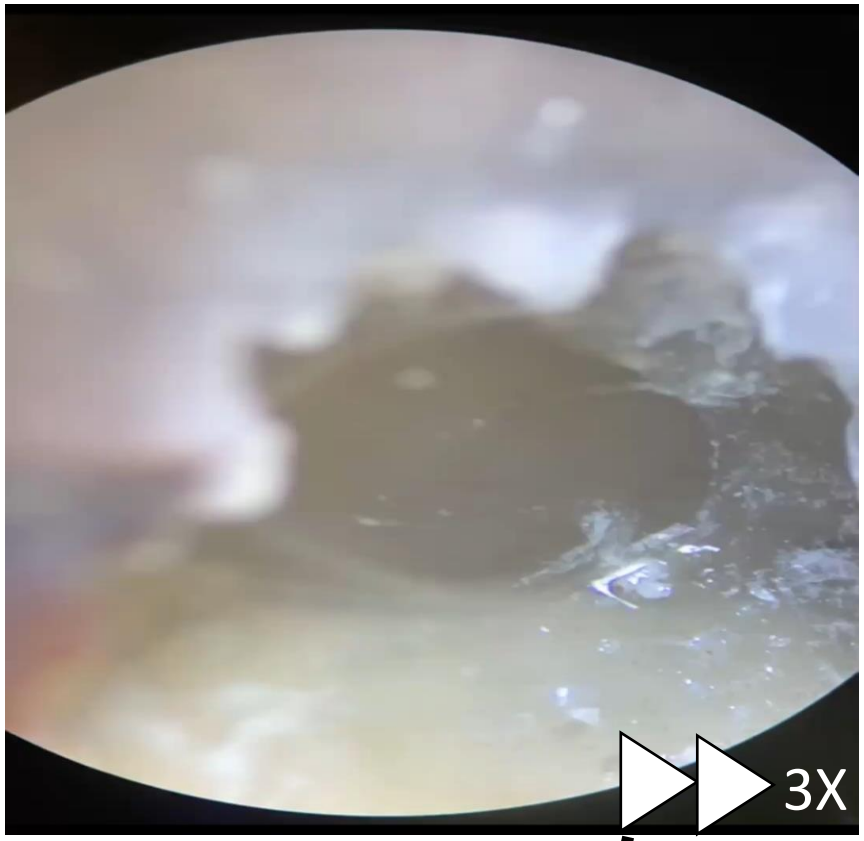
- Oysters show change in physiological assay across emersion



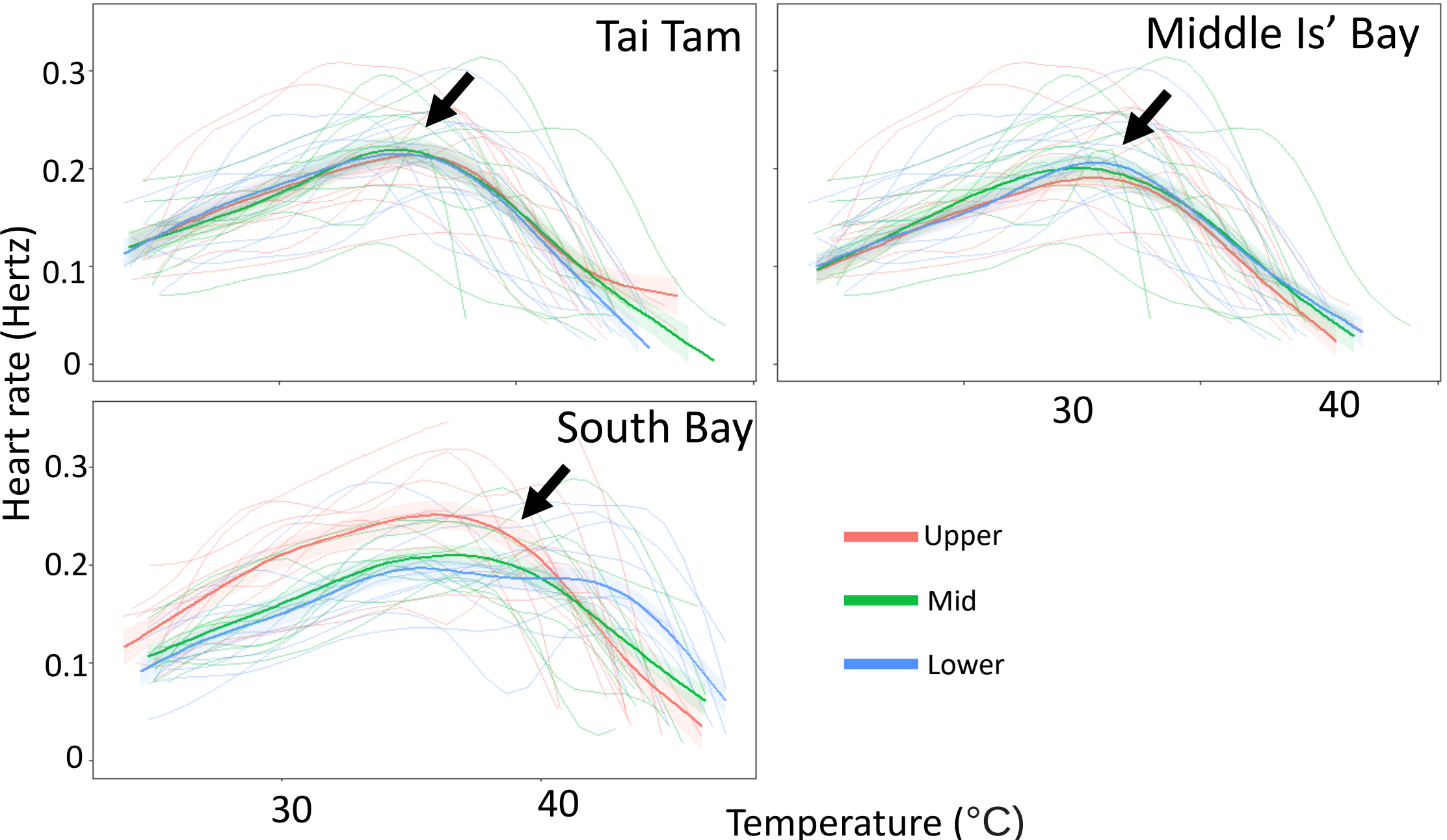



(2) What is the thermal performance of *Saccostrea cucullata*? How does this relate to their thermal regime?

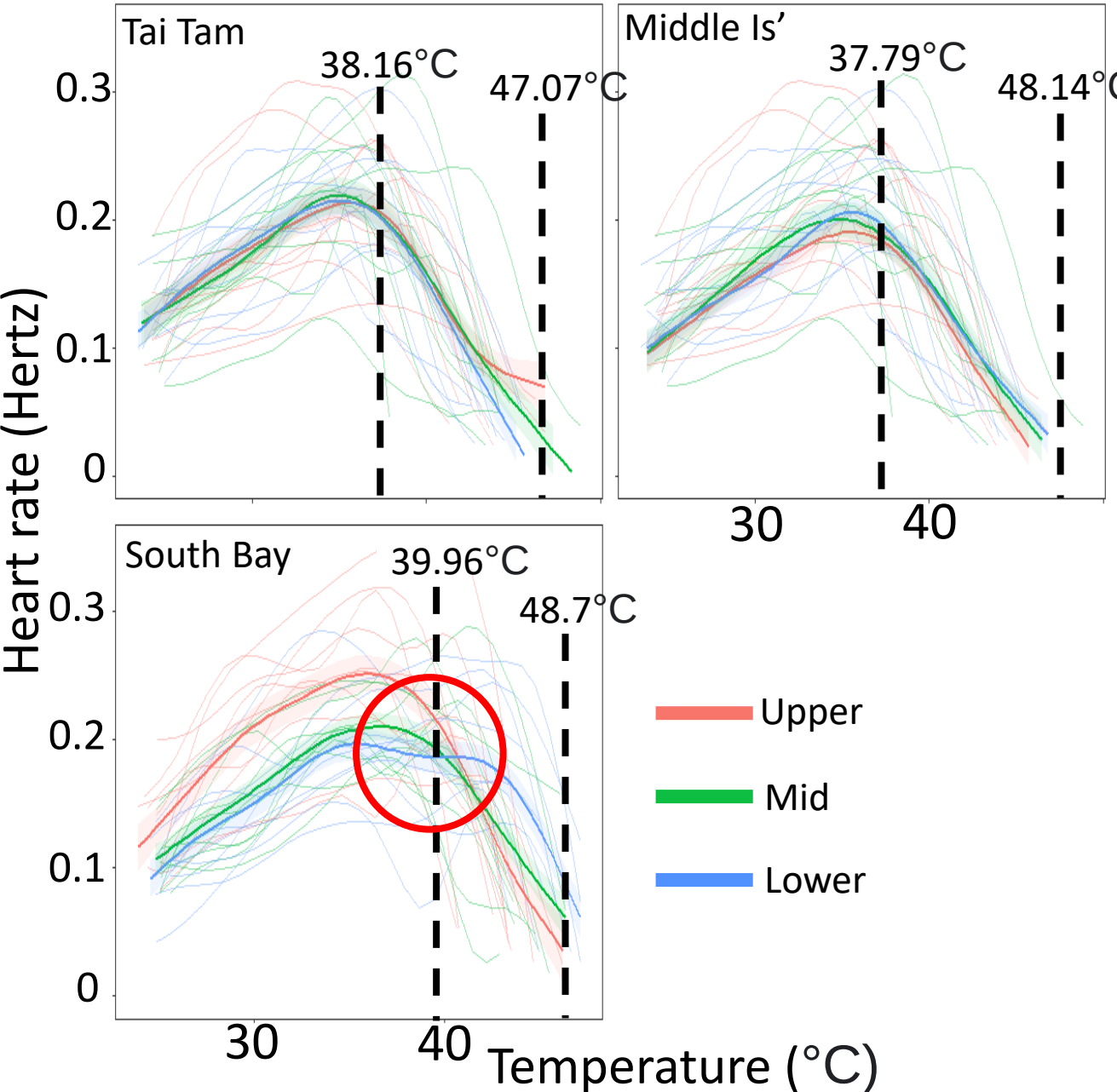
# Thermal performance of oysters

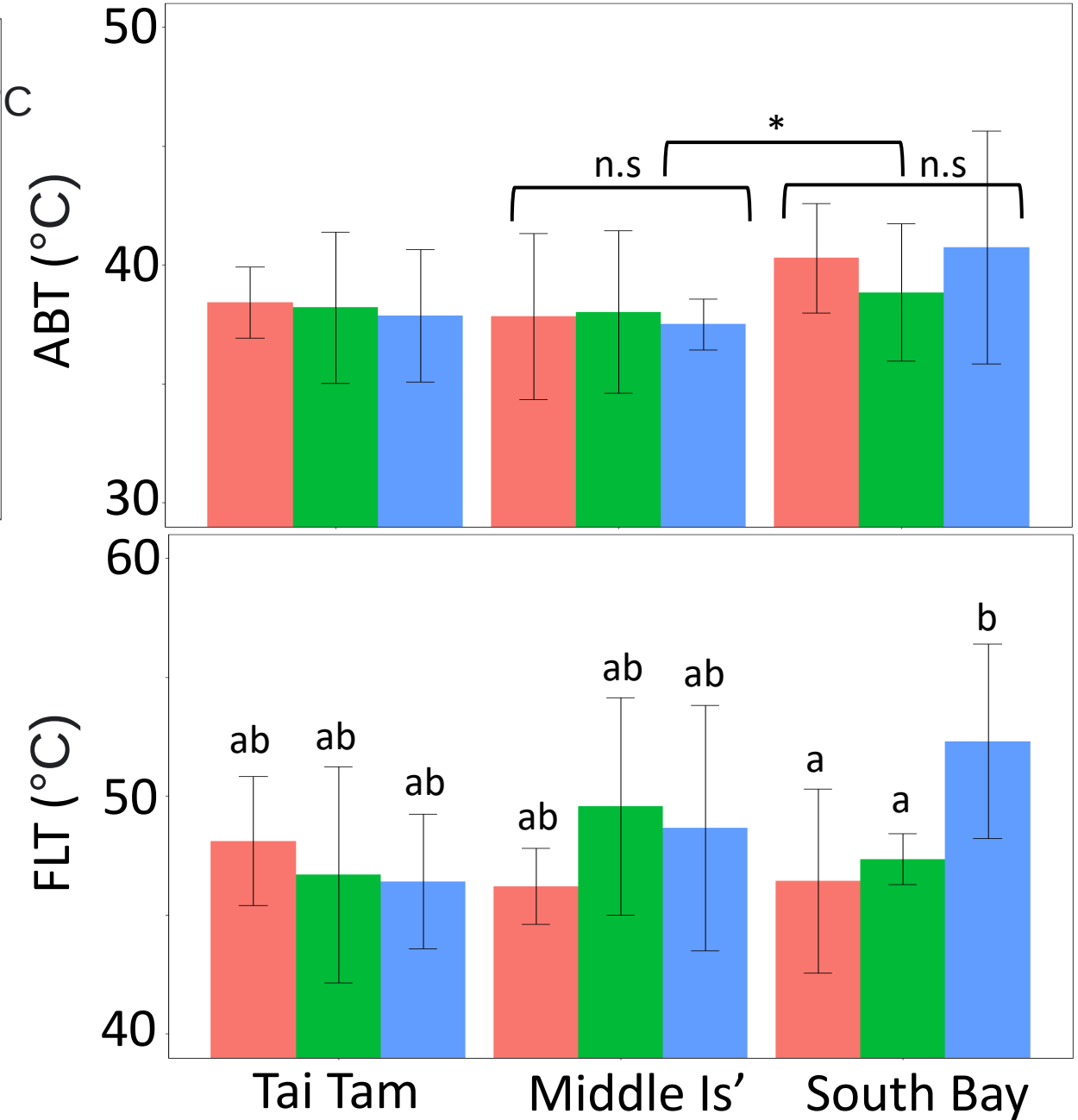




# Heart rate curve of *Saccostrea cucullata*

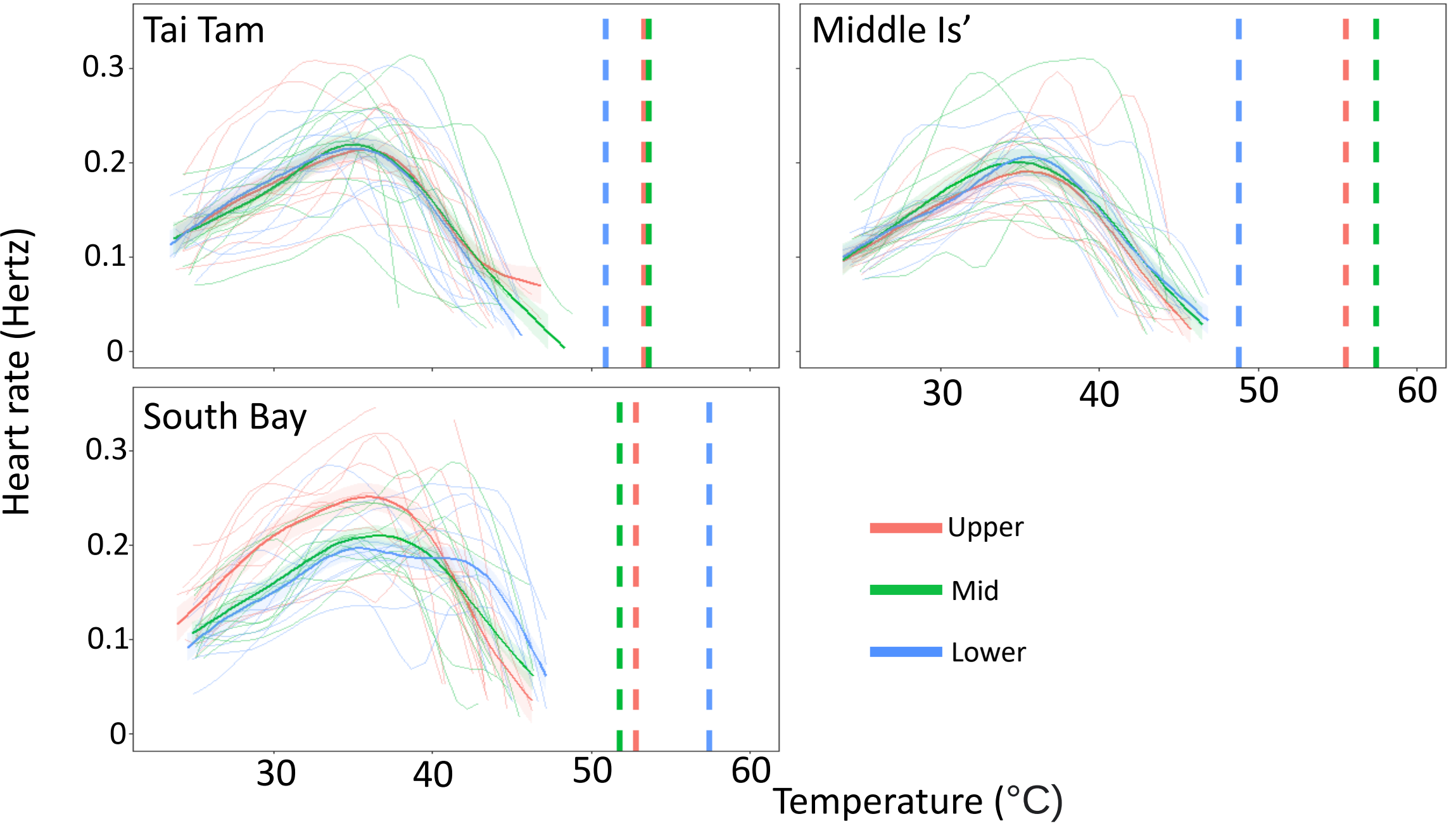


# Thermal performance of *Saccostrea cucullata*



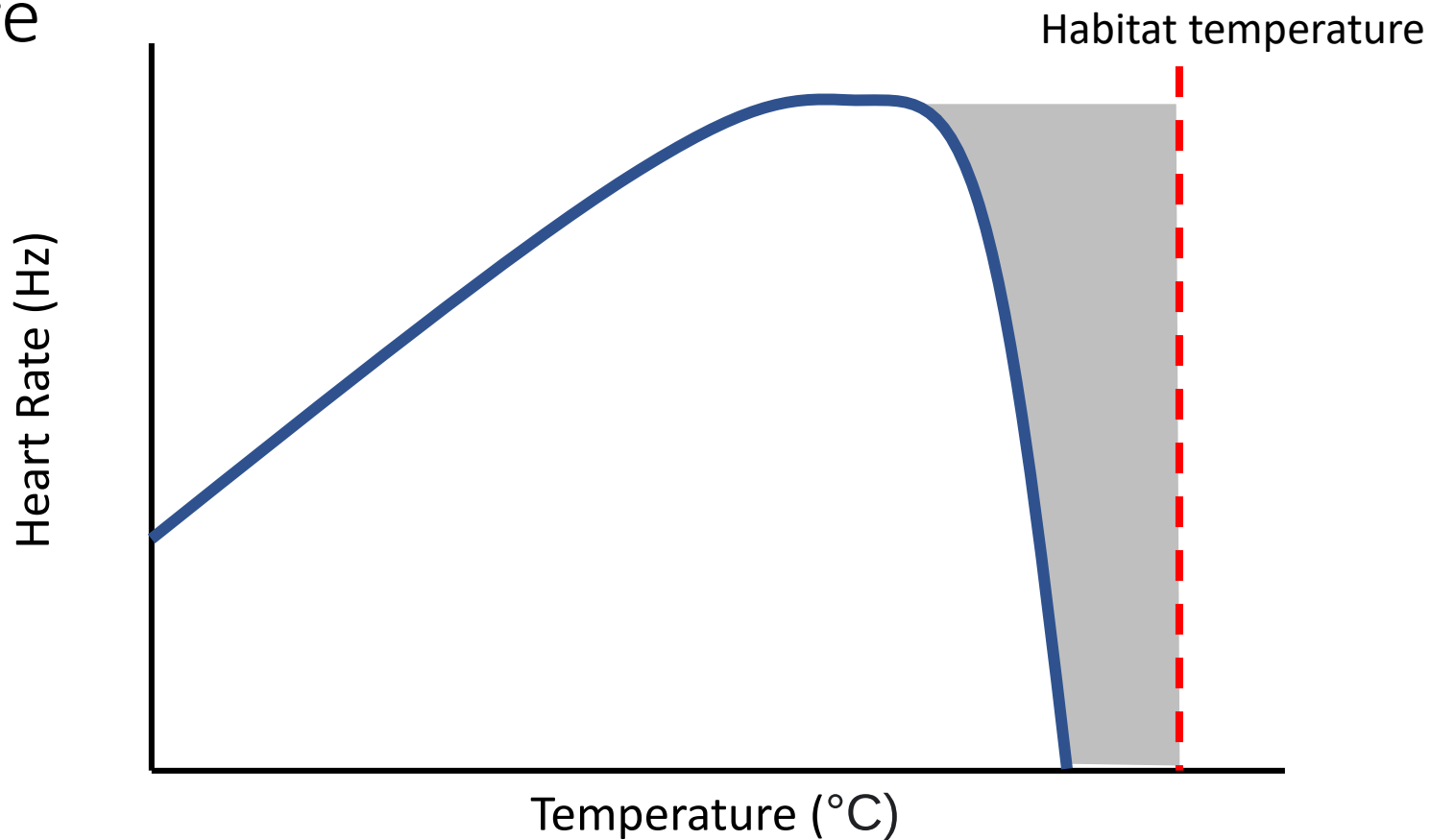
# Oysters vs the environment



# (2) What is the thermal performance of *Saccostrea cucullata*? How does this relate to their thermal regime?

Summary

- Oysters' physiological responses are acclimated to their residing habitat
- Oysters' thermal tolerance fall below the maximum environmental temperature



# The final slide

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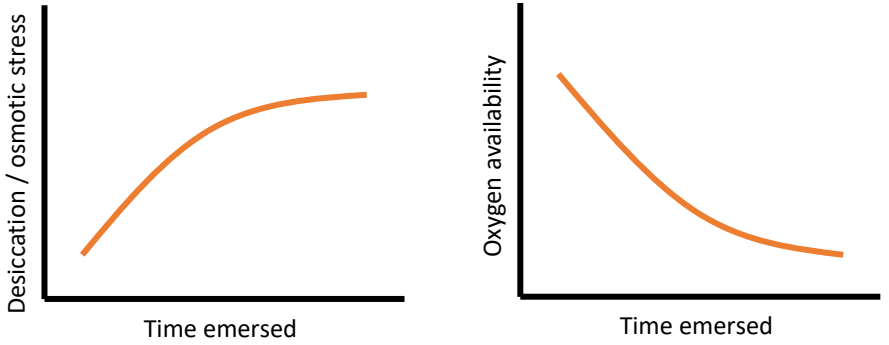
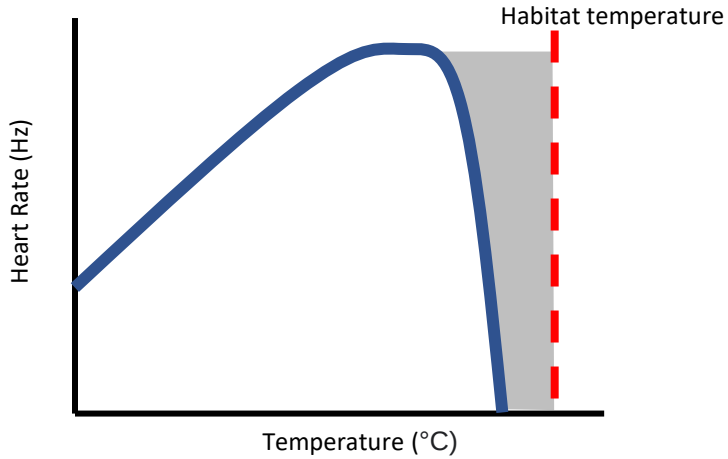
- Decrease in blood oxygen, increase in osmolality; Different among thermal regime




- Thermal performance different among thermal regime,
- Fall below environmental maximum temperature



# Acknowledgements

Prof. Gray A. Williams

Prof. Stefano Cannicci

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TIDE Group

# Q & A Session

# Reference


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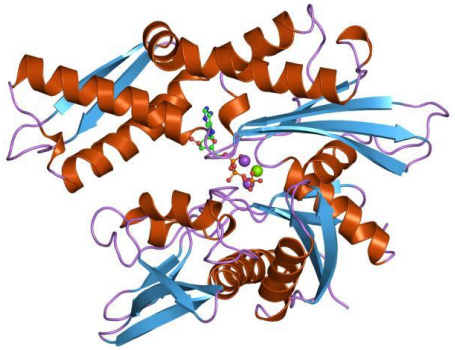
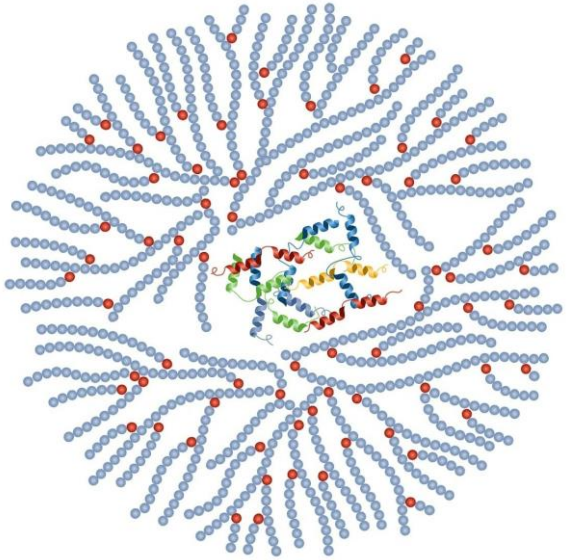
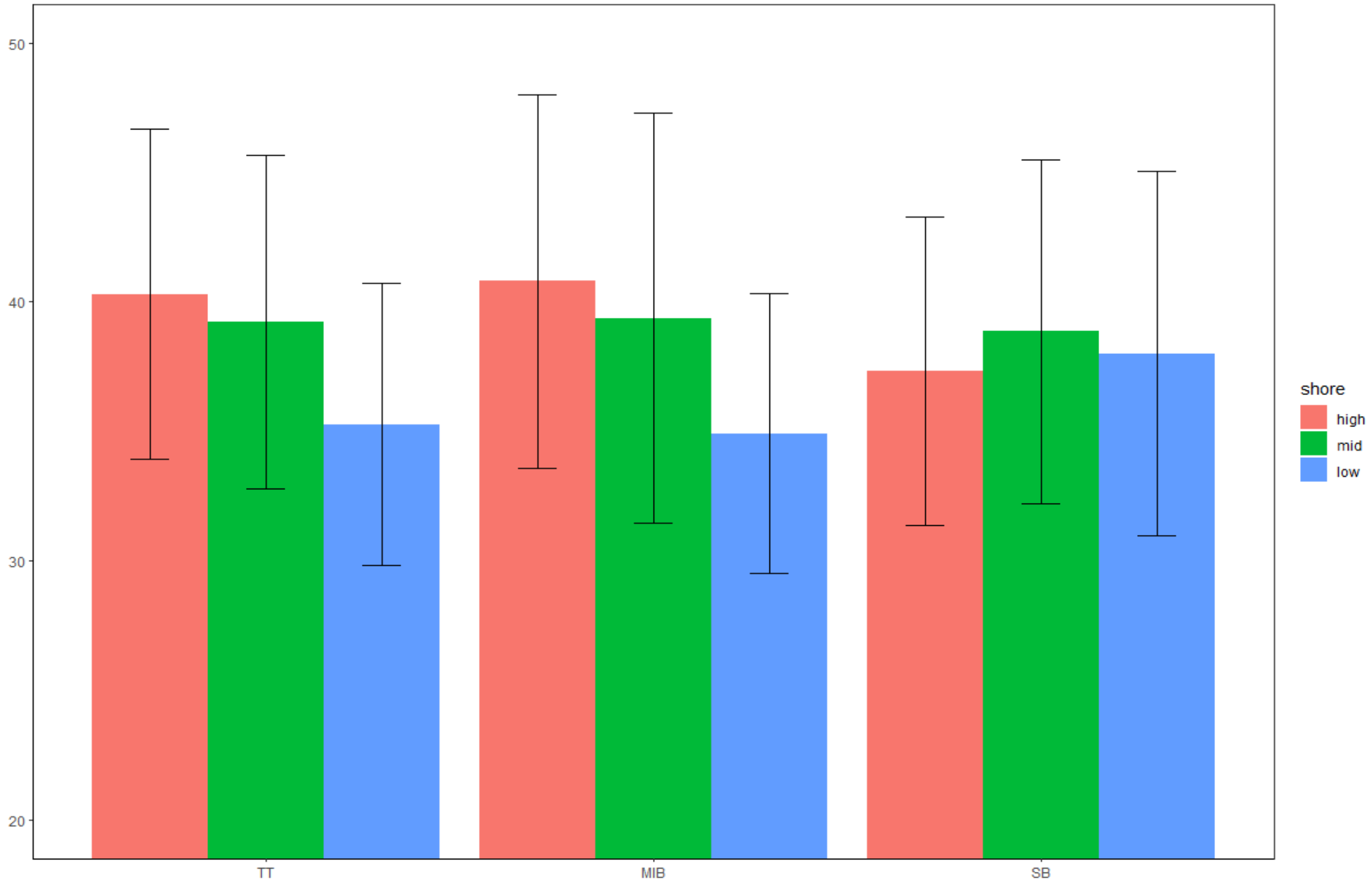
# Future work

- Further into physiological response
  - Heat shock protein
  - Glycogen assay measurement





- Behaviour of oysters?
  - Oyster gape monitoring
  - Behavioural manipulative experiment


50
40
30
20
TT
MIB
SB
shore
high
mid
low

# Heart rate curve of *Saccostrea cucullata*