Hard Clam Response to a Warming Environment: a Mesocosm Experiment.

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Objectives

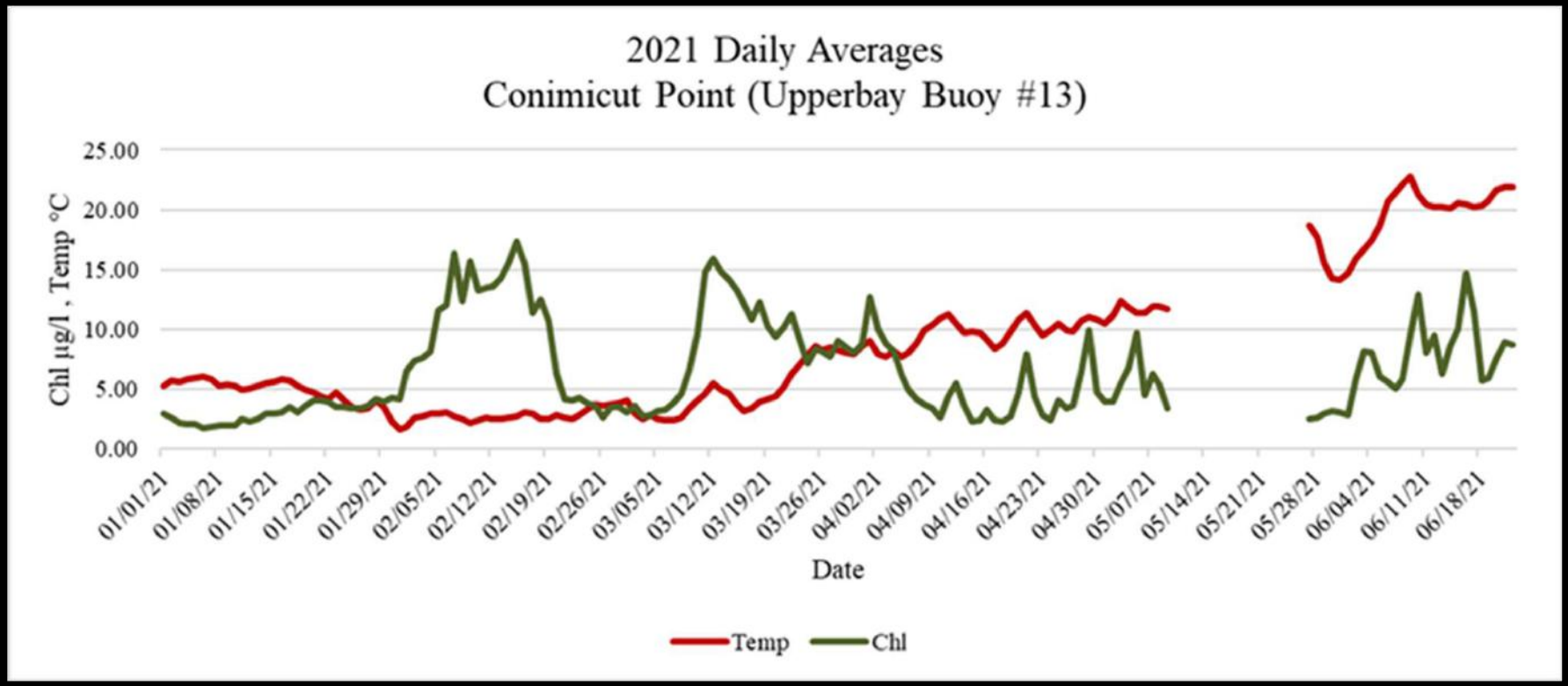
Investigate the impact of the winter-spring phytoplankton bloom on the hard clam

Investigate the impact of sediment on the hard clam

Hypothesis & Rationale

Weakening/loss
of the winter-spring bloom will
result in diminished
recruitment, condition, growth
of the hard clam

- Winter spring bloom
food store benthic community
- Bay to warm 3-6°C by 2100
- Food & temperature primary
factors

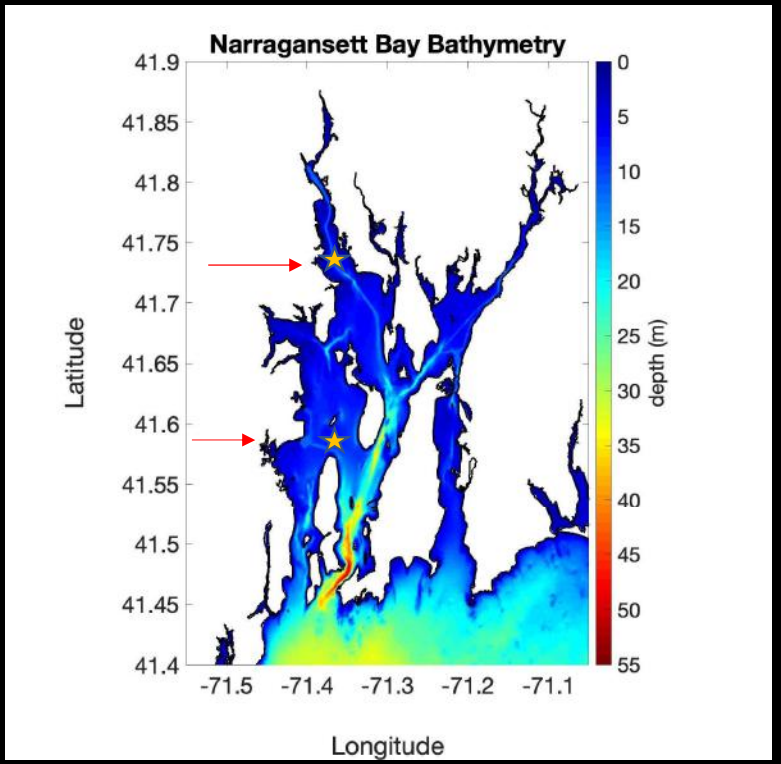


Winter Spring Bloom and Temperature

Sediment Selection

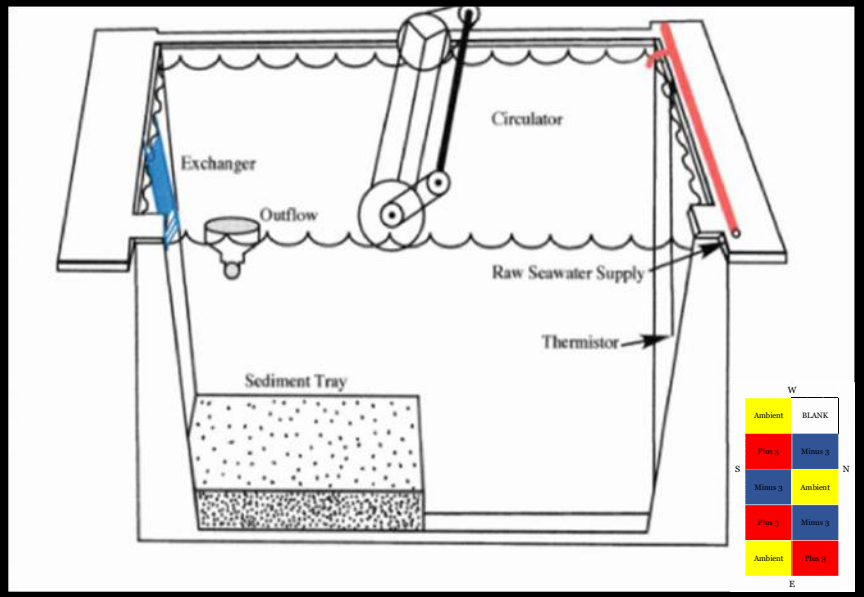
- Two sites,
- “H” Polluted vs pristine sediment
- Are legacy contaminants a factor?

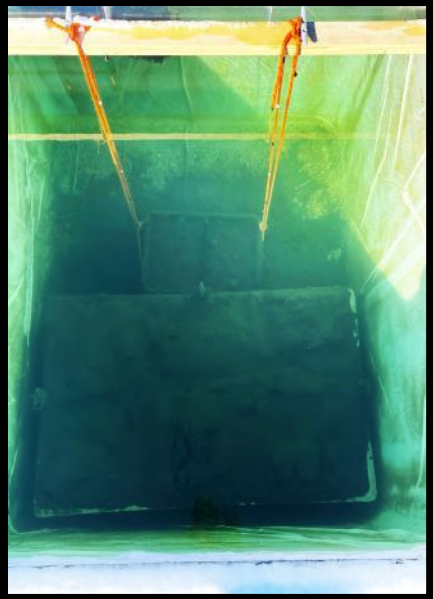
- 2021 – PRE (Conimicut pt.)
- 2022 – MB (Jamestown)



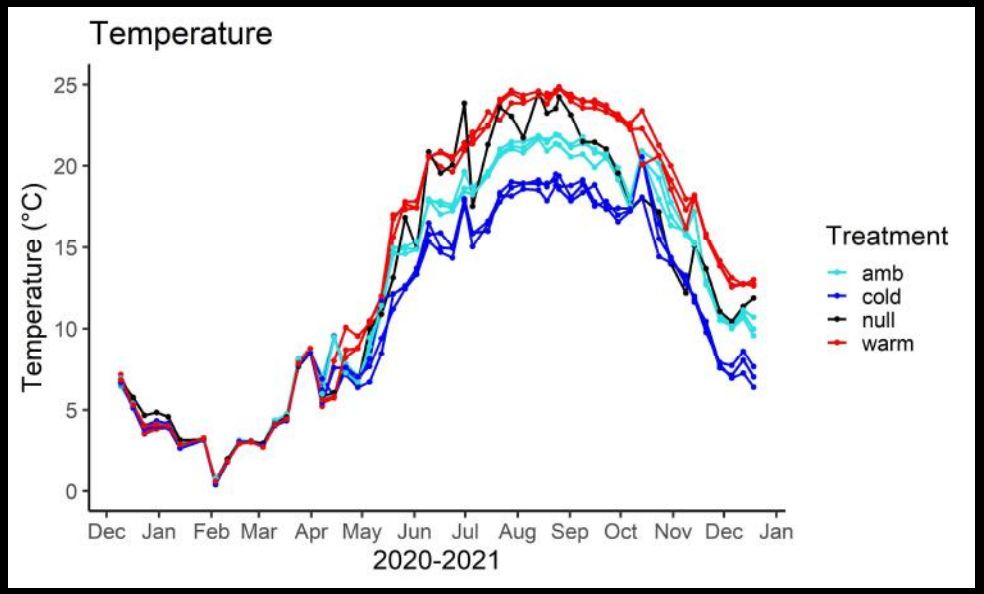
Unpublished Flecchia 2022

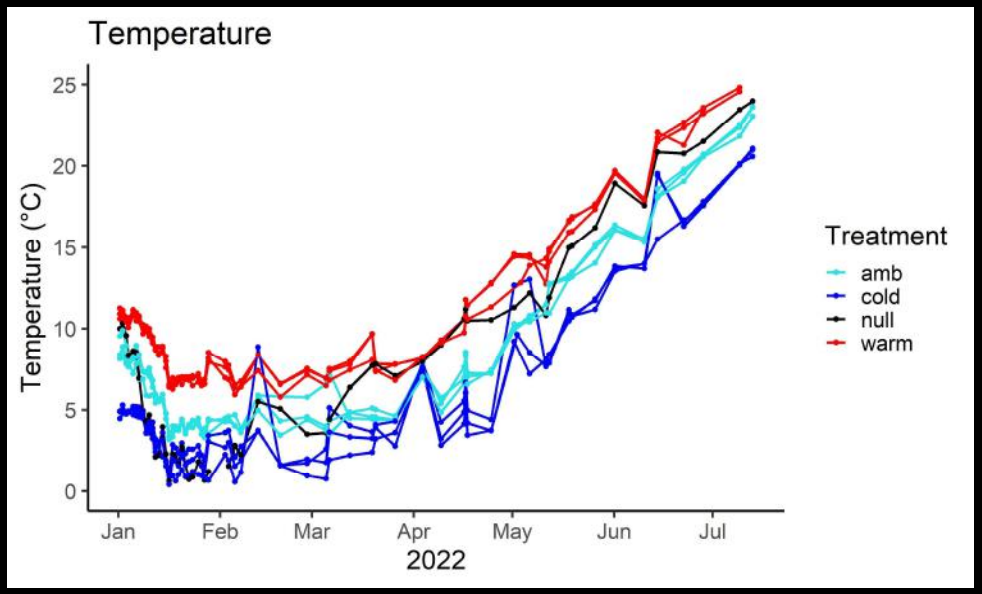
Mesocosm Model



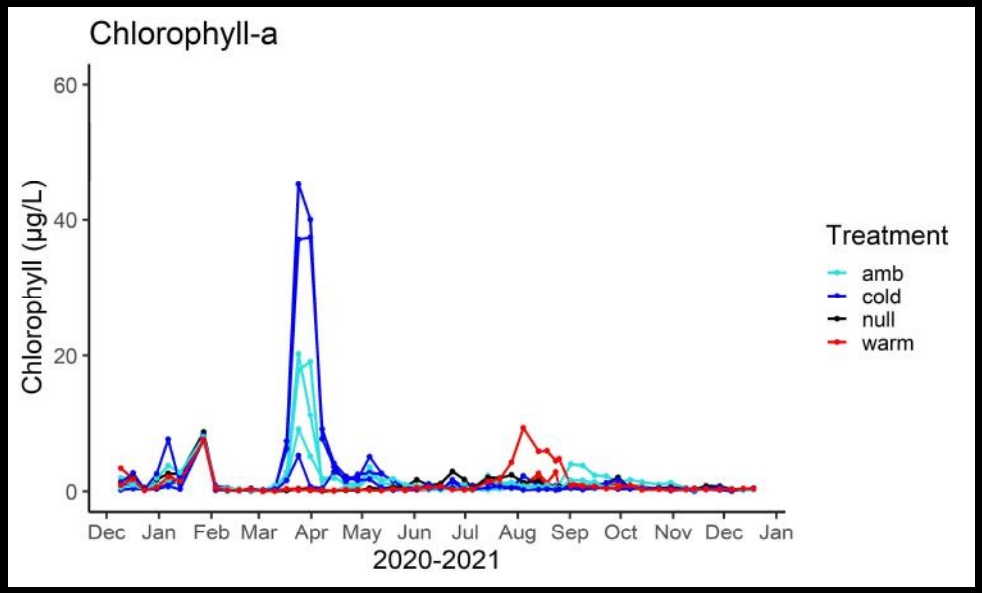


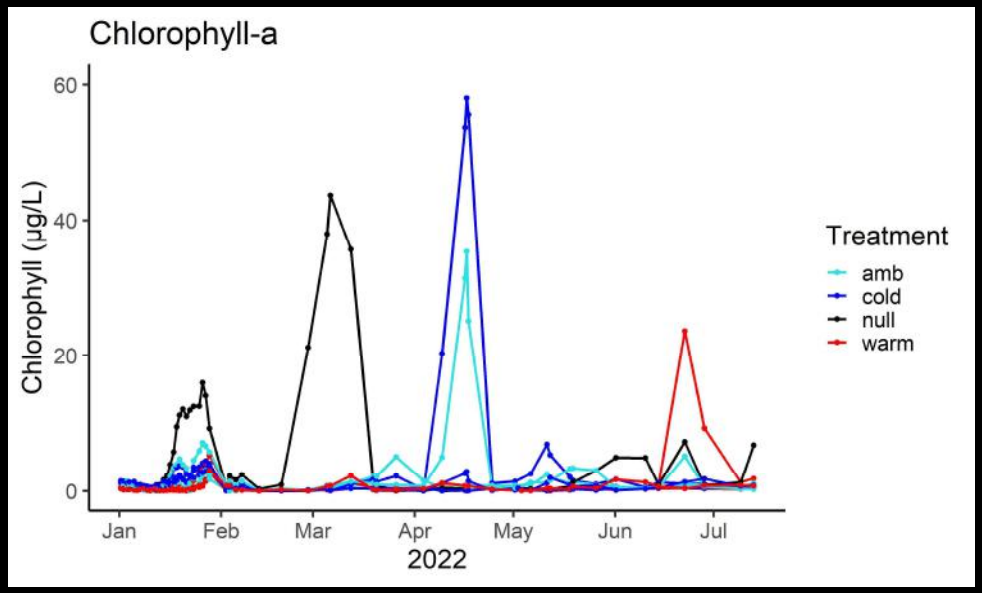
Temperature





Primary production Chl-a





Now to the Clams

- Recruitment / reproductive potential

- Condition / heath

- Growth

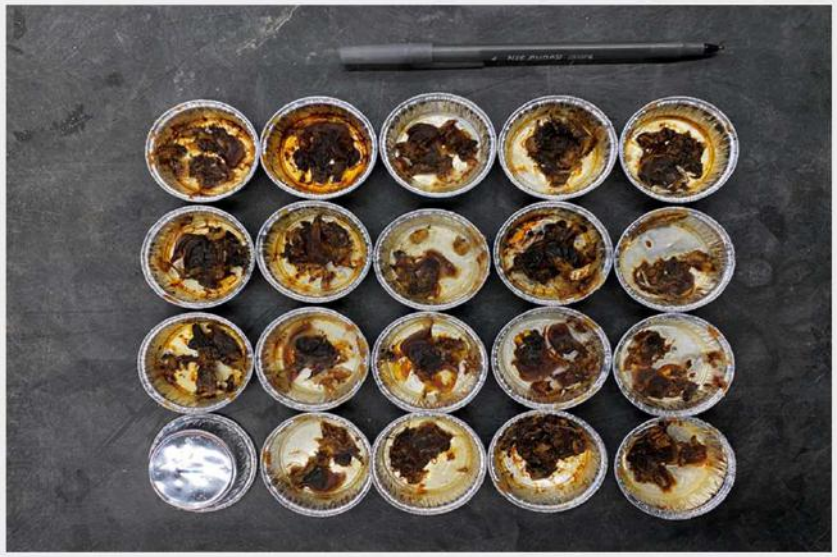
Looking at the Stages of Gonad as a Metric of Fecundity

Engorged

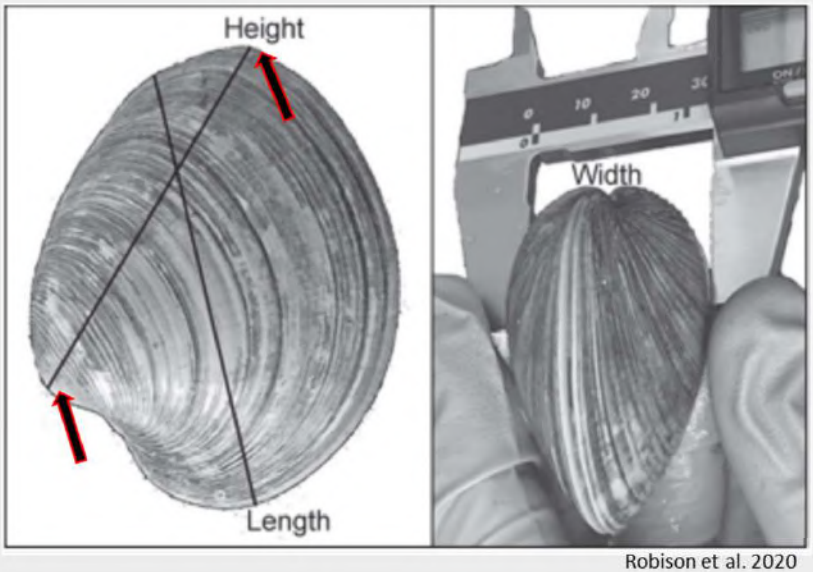
Partially Engorged

Reduced

Condition Index and Growth



CI= [dry soft tissue wt (g) *1000] / [total wt (g) – Shell wt (g)]



Robison et al. 2020

Ordered Logistic Regression MASS Package in R

This type of model looks at the relationships between Condition, Growth, and Treatment on the likelihood of a clam belonging to any one of the Progressive Gonad Stages

Model Results

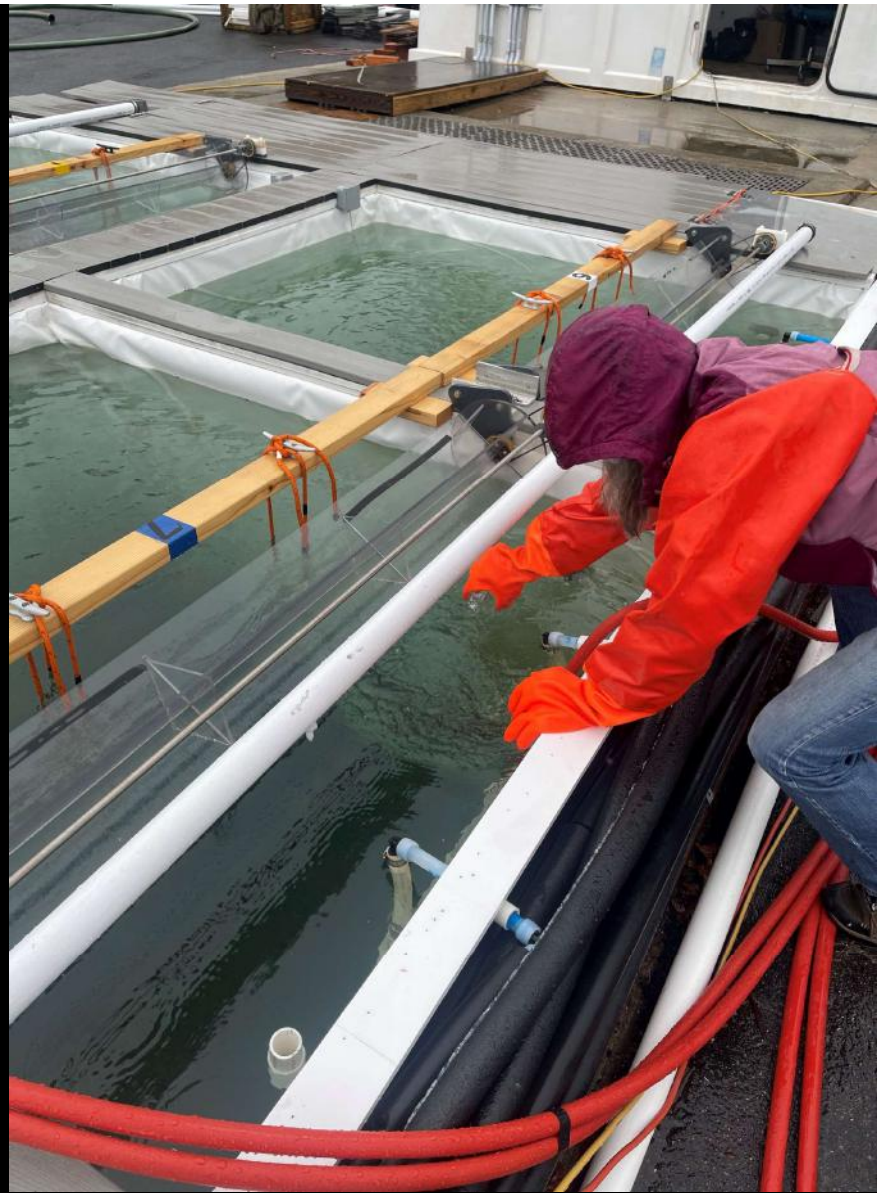
(Bloom effect)

Higher Condition, greater likelihood of being reproductive

Higher Growth, lower likelihood of being reproductive

Cold Treatment greater likelihood of being reproductive

Warm Treatment lower likelihood of being reproductive



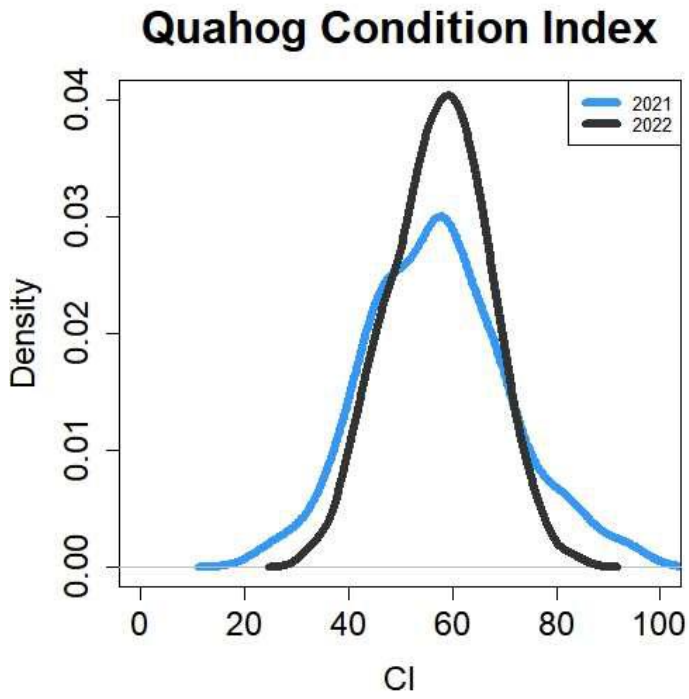
What about the sediment?

PRE vs MB

CI metric for health/success of clams

No significant difference between experiments with respect to

CI and sediment



Conclusion

Do the results support the hypothesis

Recruitment	Condition	Growth
✓	✓	x

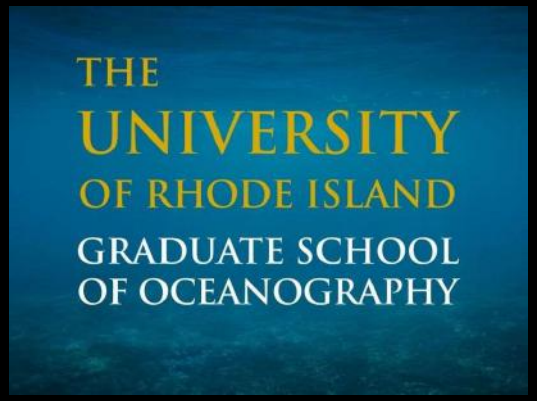
Acknowledgments

My Committee, & PI's working together on the Mesocosms

Support from Ed Baker & MSRF

Interns and friends at MERL (Esp. Kristin, Kathryn, Riley)

RI Sea Grant for funding & support



Model Results 2021

For every one-unit increase in condition

Clam Gonad was 8.7% more likely to be engorged or partially engorged vs Reduced.

-Higher Condition, greater likelihood of being reproductive

For every one-unit increase in growth

Clam Gonad was 1.4x less likely to be Engorged vs Partially Engorged or Reduced

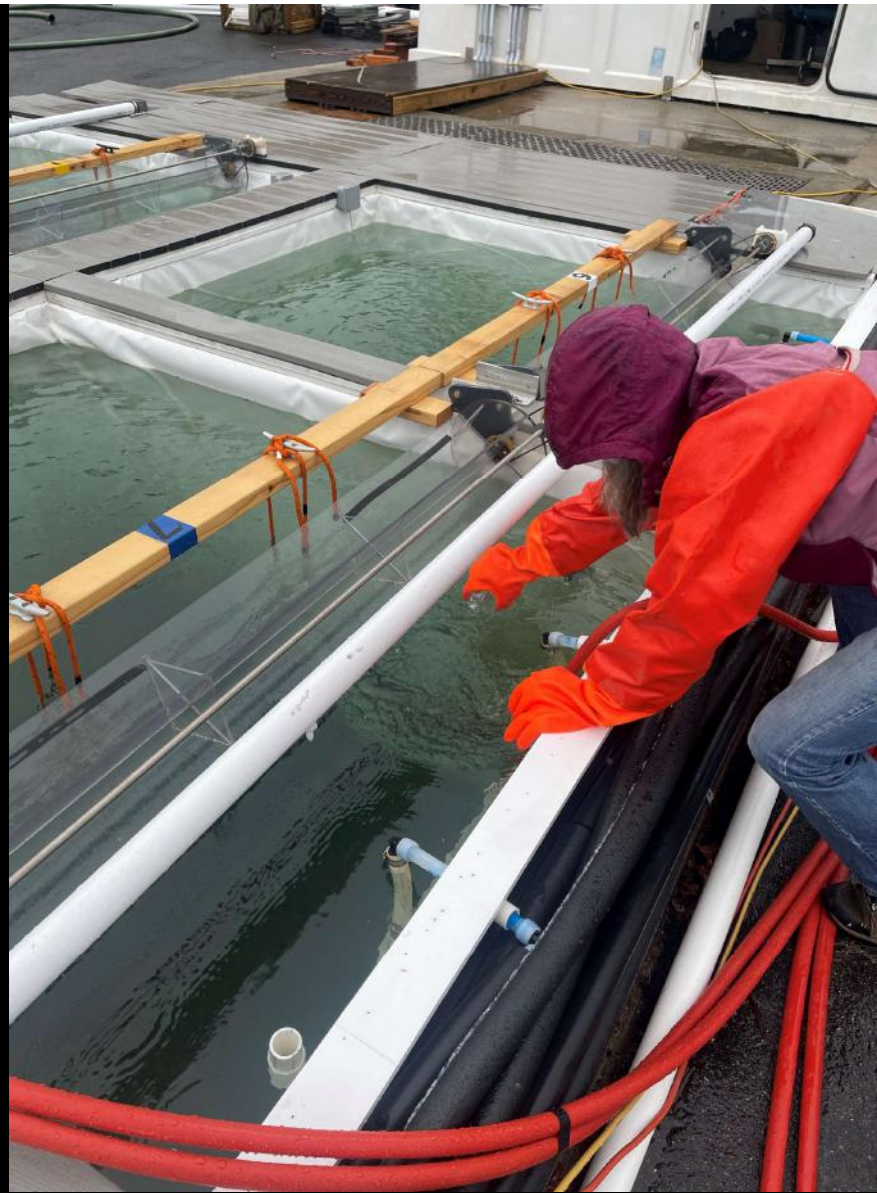
-Higher growth, lower likelihood of being reproductive

Clams in the Warm Treatment (C-A ~ NSD)

Clam Gonad was 8.2x less likely to belong to be Engorged vs Partially Engorged or reduced.

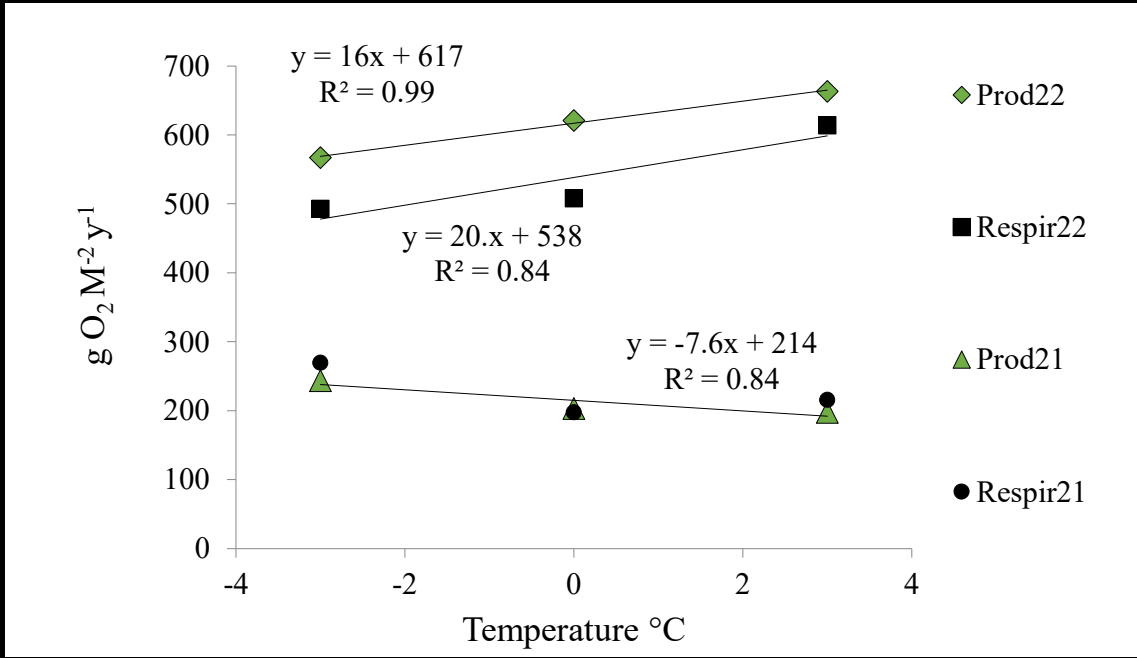
-Cold treatments greater likelihood of being reproductive

-Warm treatments lower likelihood of being reproductive

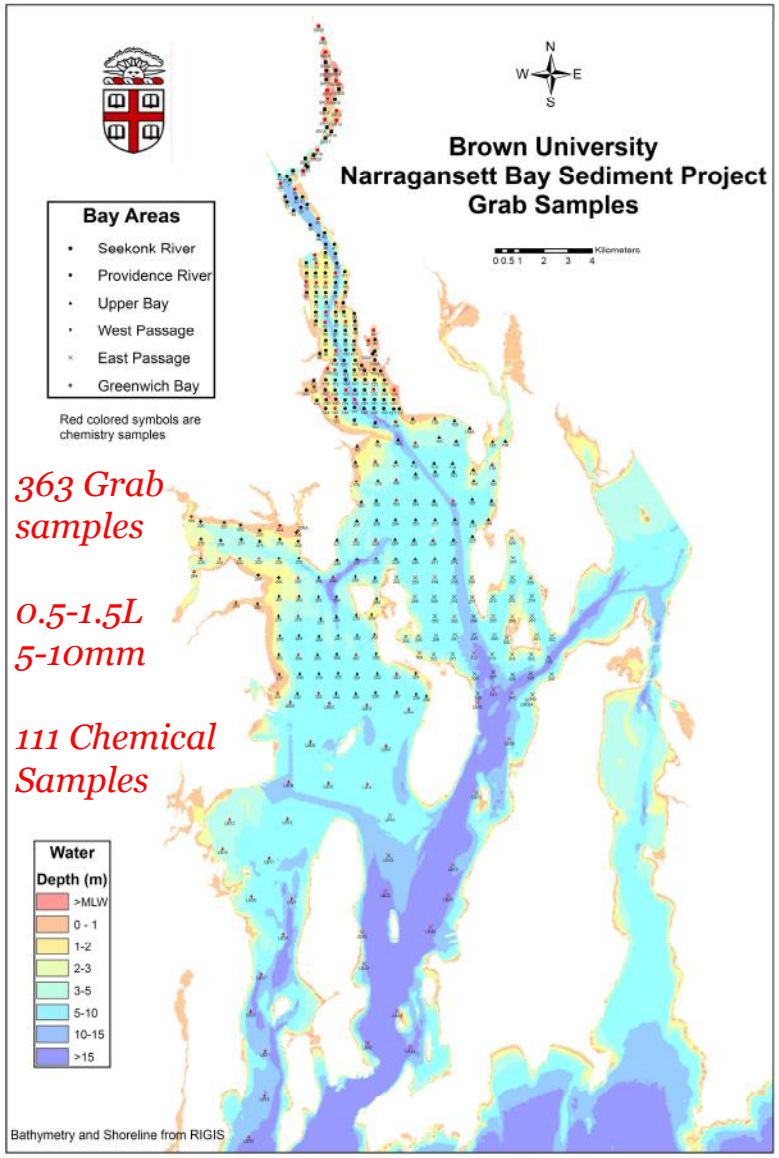


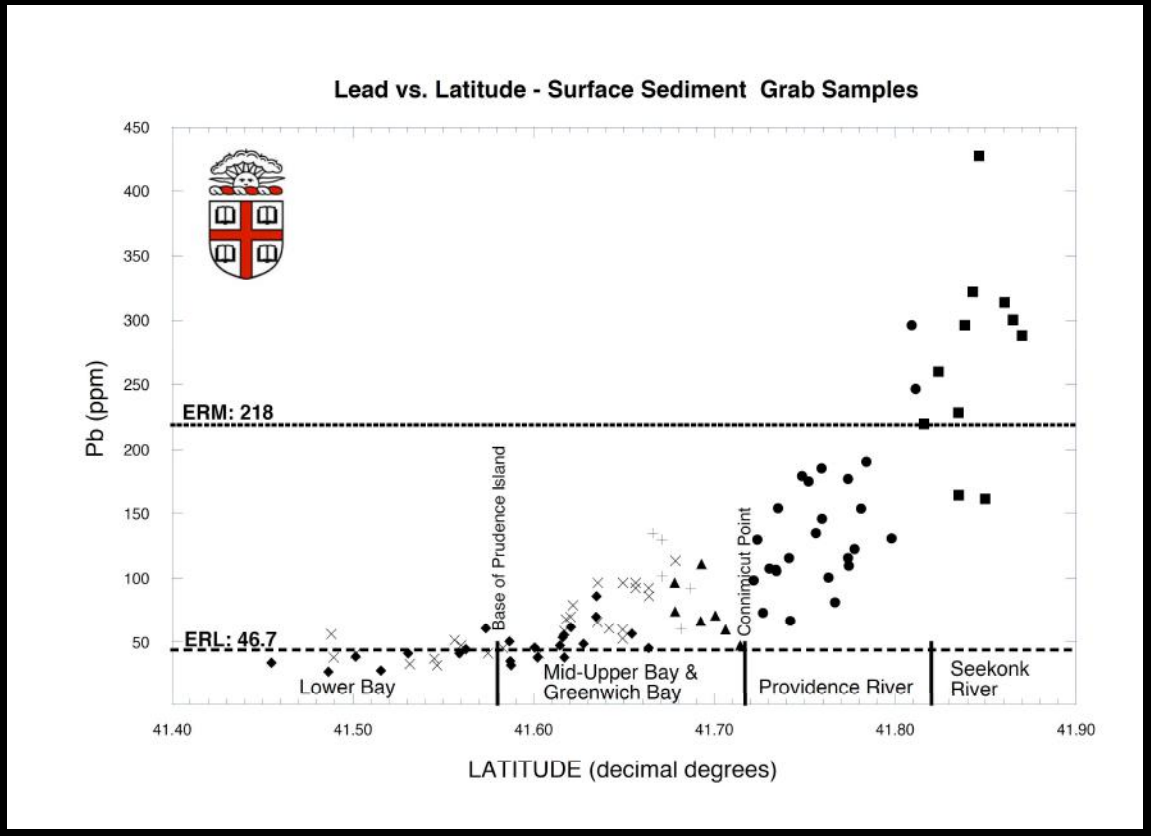
System Production vs respiration

Differences between types of primary production between experiments

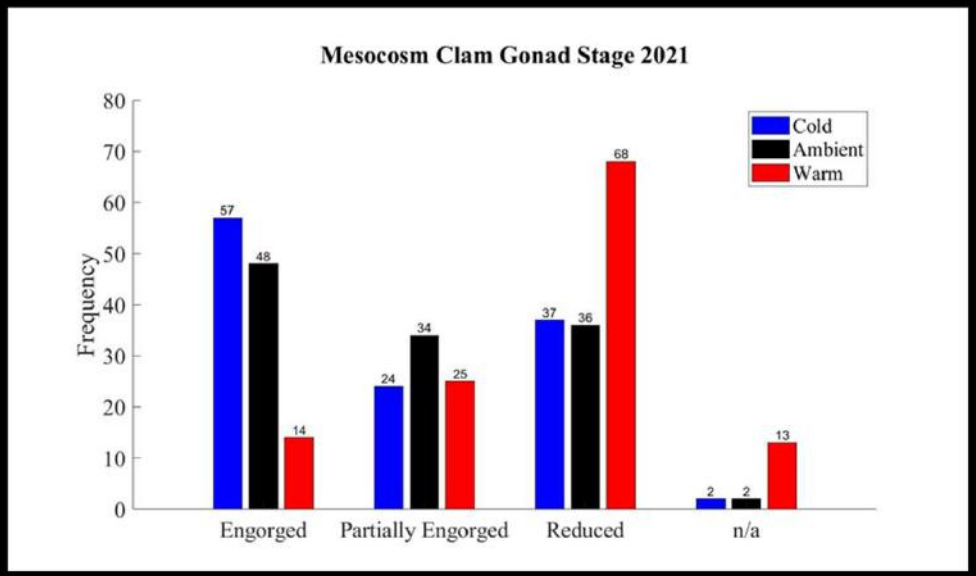


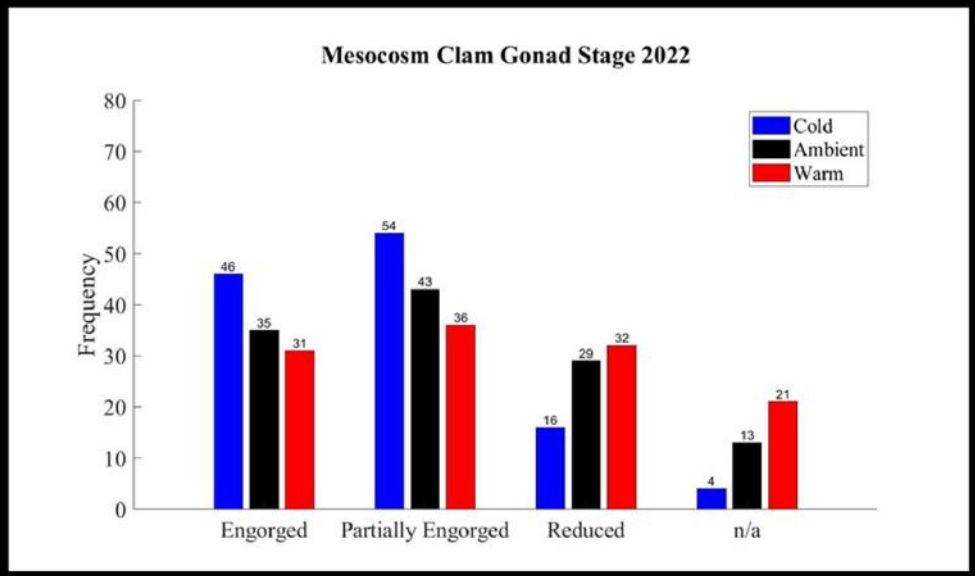
Sediment Stuff



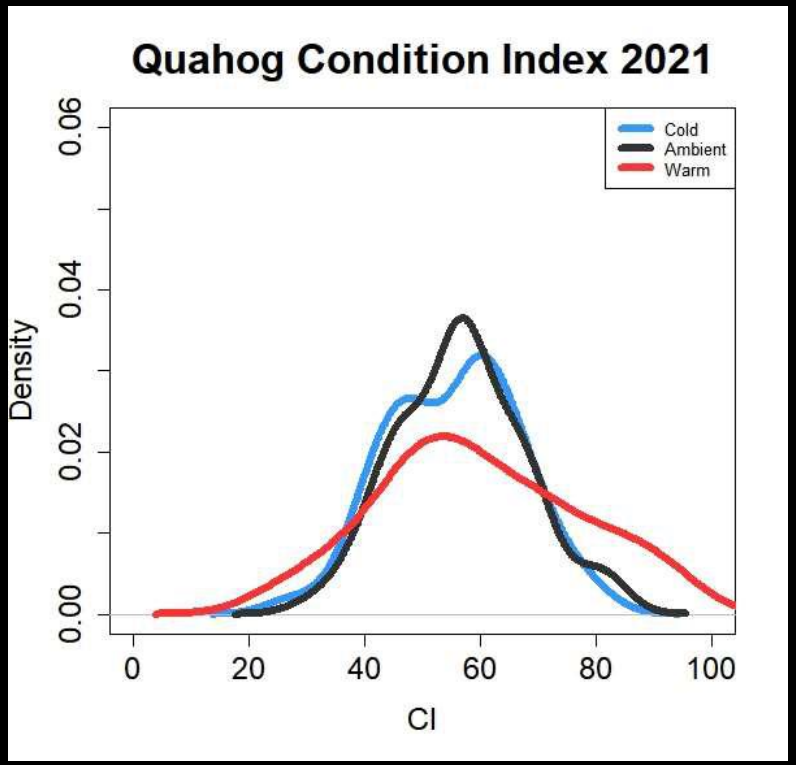


Gonad Stage as a Metric

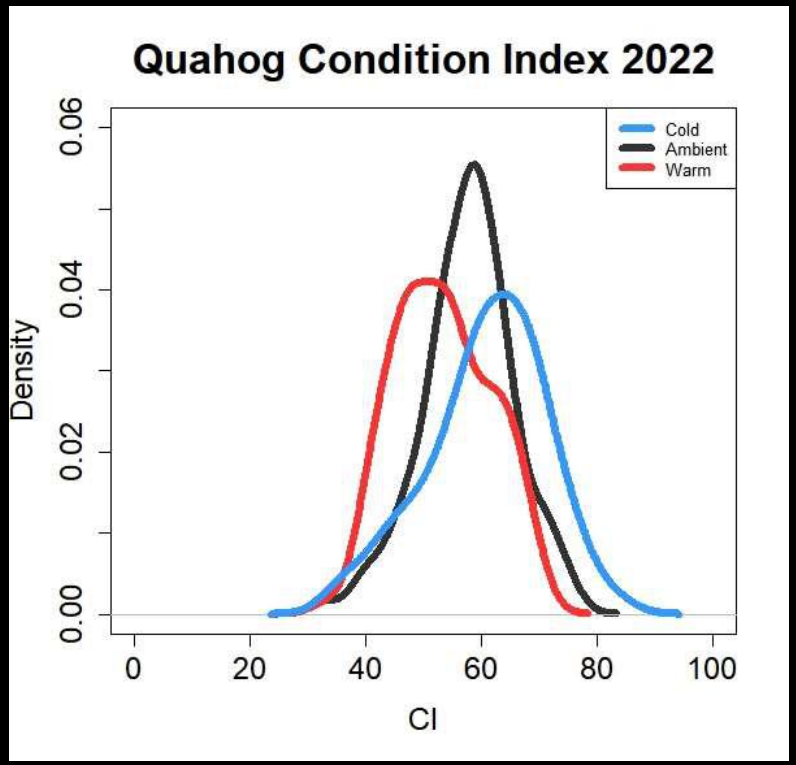




Condition Index

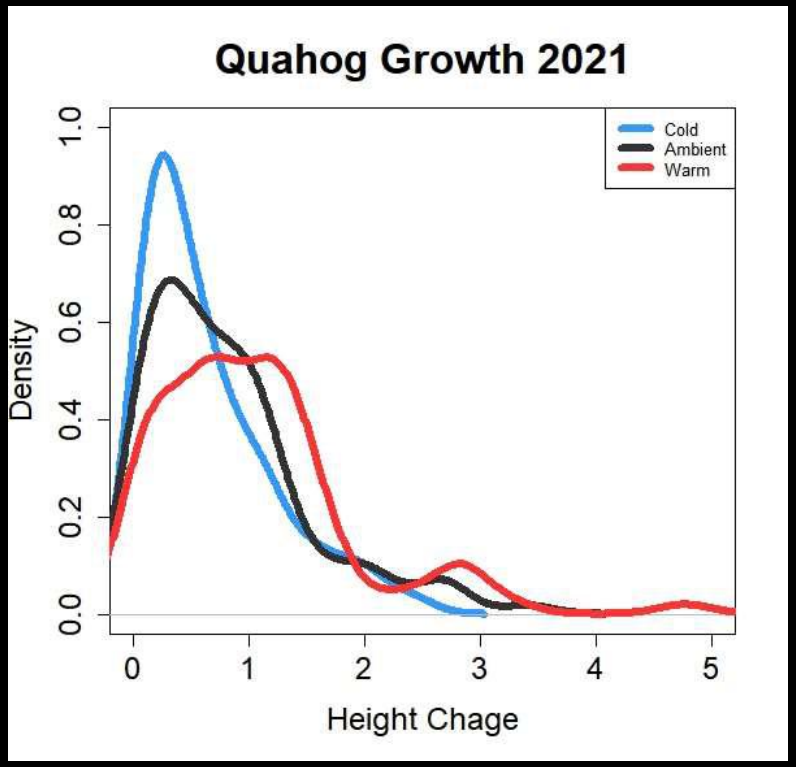


C/W P-Significantly different (0.036)

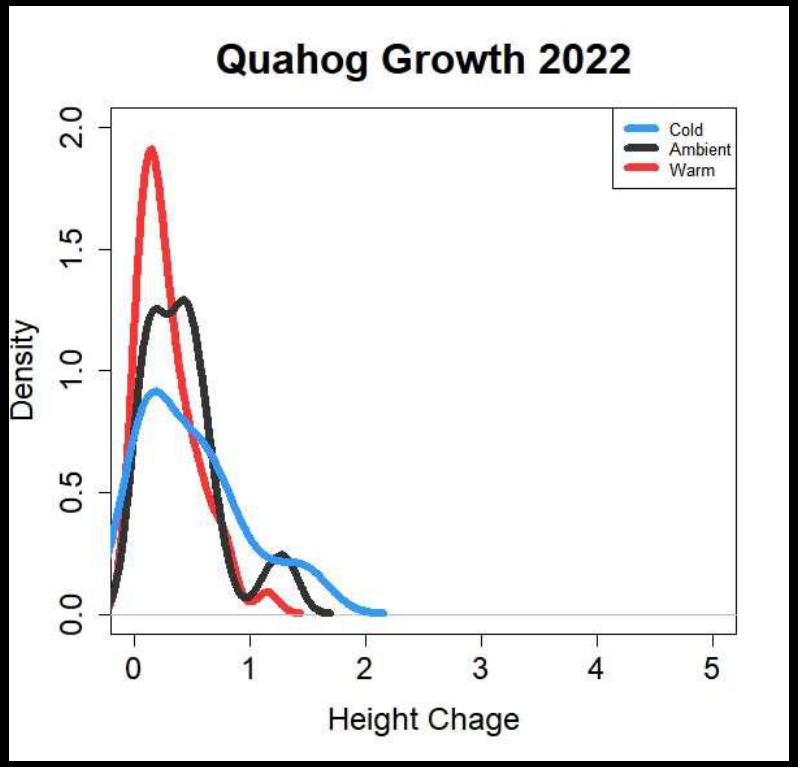


All Groups Significantly different from each other

Growth Measurement



All Groups Significantly different from each other



A/W Significantly different from each other