Assessment of Manila Clam Larval Survival and Physiology at Increased pCO_2 Levels

David C. Metzger*[1], Shallin Busch[2], Paul McElhany[2], Carolyn S. Friedman[1], Steven B. Roberts[1]

[1]School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA., [2]Northwest Fisheries Science Center, NOAA, Seattle, WA

Introduction

Ocean Acidification as a result of increasing levels of dissolved CO_2 has been shown to impact the survival, physiology, and morphology of calcifying organisms.

Larval stages are thought to be at particular risk among bivalve species due to their dependences on soluble calcium.

Limited studies exist that focus on the transcriptional response of calcifying organisms exposed to increased pCO_2.

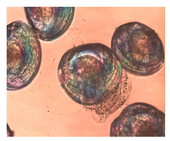
Goals

1. Assess the impacts of elevated pCO_2 treatments on clam larval survival and morphology.

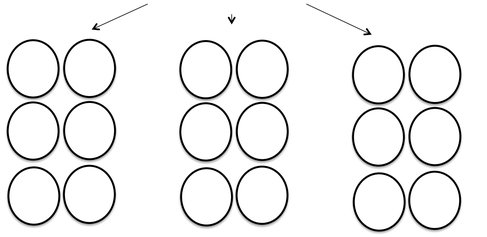
2. Characterize physiological changes at the molecular level as a result of elevated pCO_2 conditions.

Experimental Design

5 day old larvae



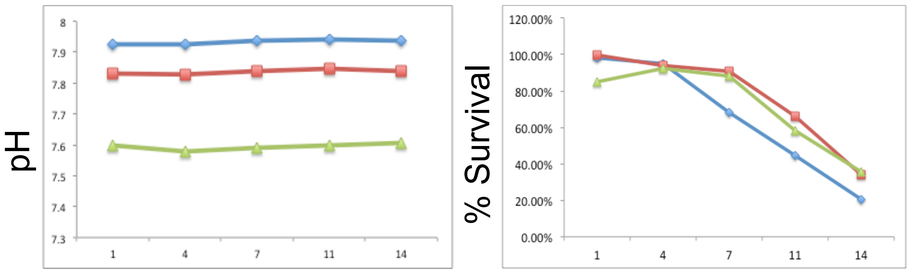
Split into three pCO_2 treatments with 6 replicates per treatment.



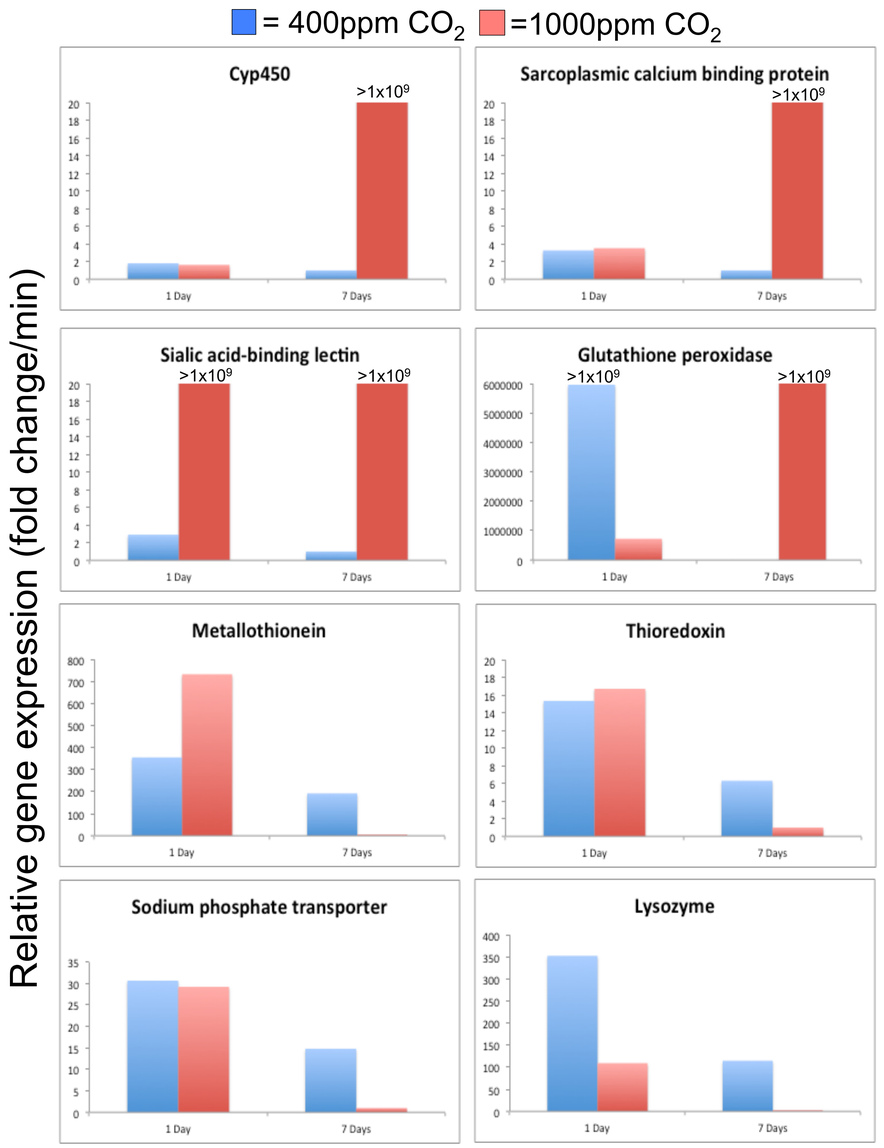
Take samples for mortality, morphometrics, and qPCR.

1, 4, 7, 11, and 14 days

Summary of pH measurements and survival at 400, 520, and 1000ppm CO_2



Gene expression



Conclusions

Elevated pCO_2 levels appear to have no impact on 5 day old larval clam survival.

Gene expression varies significantly depending on the physiological function.

Genes associated with stress response and ion transport are dramatically induced after one week of treatment at 1000ppm CO_2.

Future Directions

Generate transcriptome libraries from 1 week samples at 400 and 1000ppm CO_2 treatments.

Further validation of qPCR results including additional replicates and more time points.

Sequence and measure transcripts of genes identified in other organisms (ie sea urchins) that are thought to be impacted by ocean acidification.

Complete assessment of larval growth rates under different pCO2 conditions.

Acknowledgements

Special thanks to Taylor Shellfish farms, NOAA's Northwest Fisheries Science Center, and the University of Washington School of Aquatic and Fishery Sciences for assistance with this research. This work was funded by Washington Sea Grant and NOAA's Saltonstall-Kennedy program.