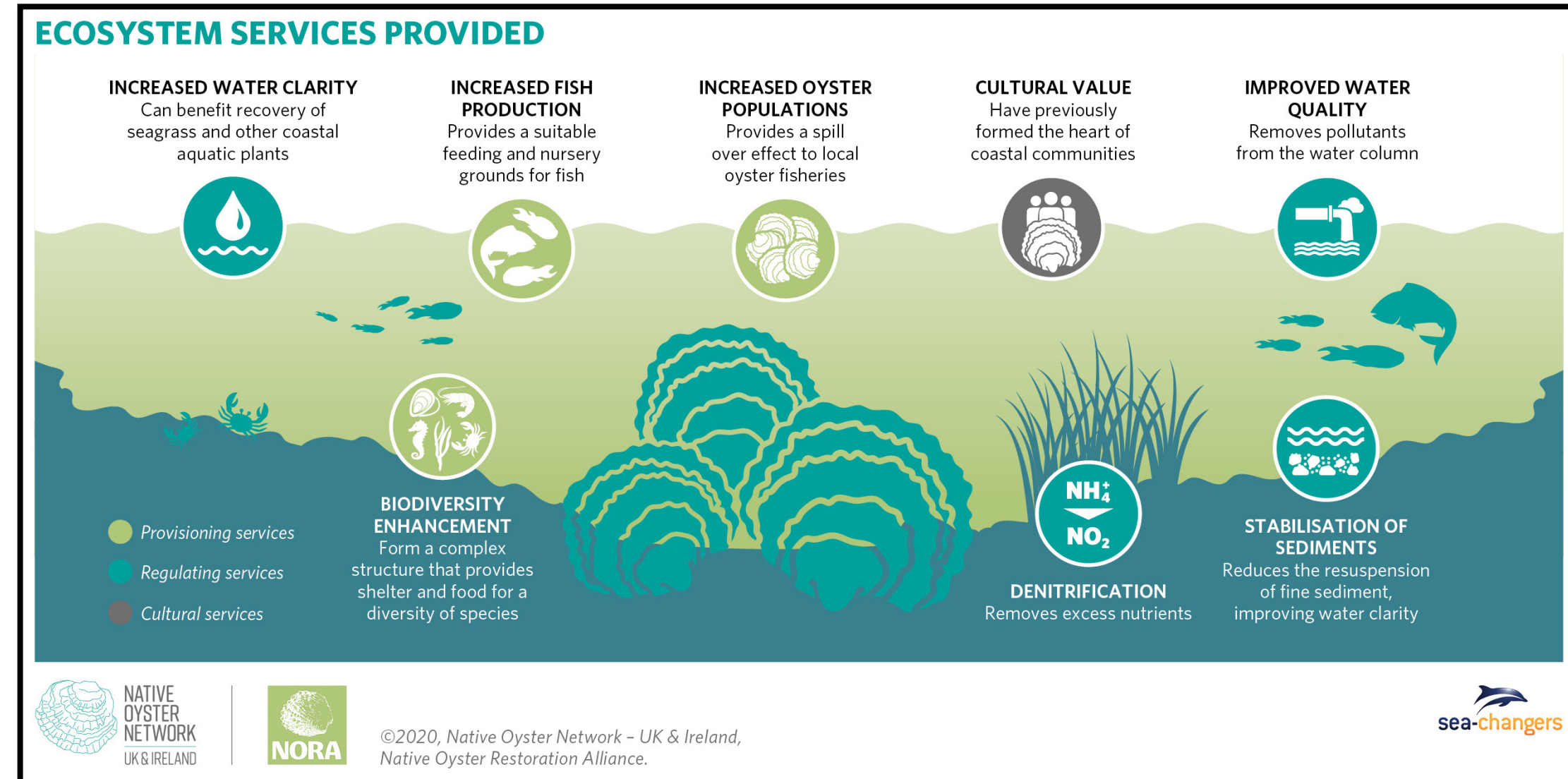


Eastern Oyster Behavioral Response to Interactions with Green Crabs

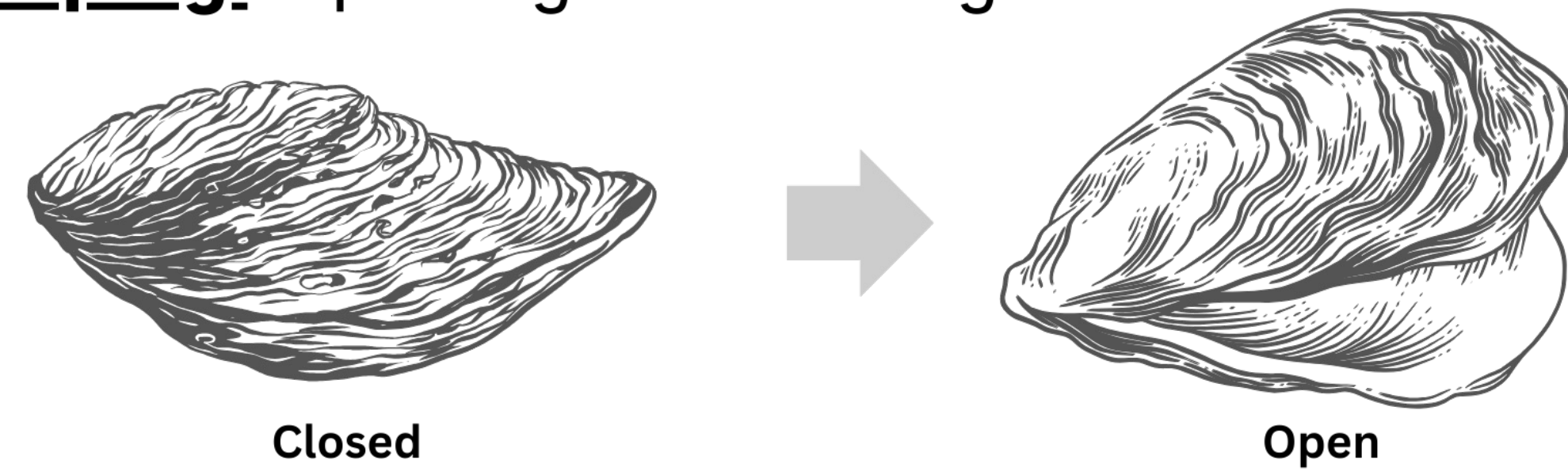
Michaela K. Edwards, Brittany M. Jellison, Easton R. White
Department of Biological Sciences, University of New Hampshire

Introduction

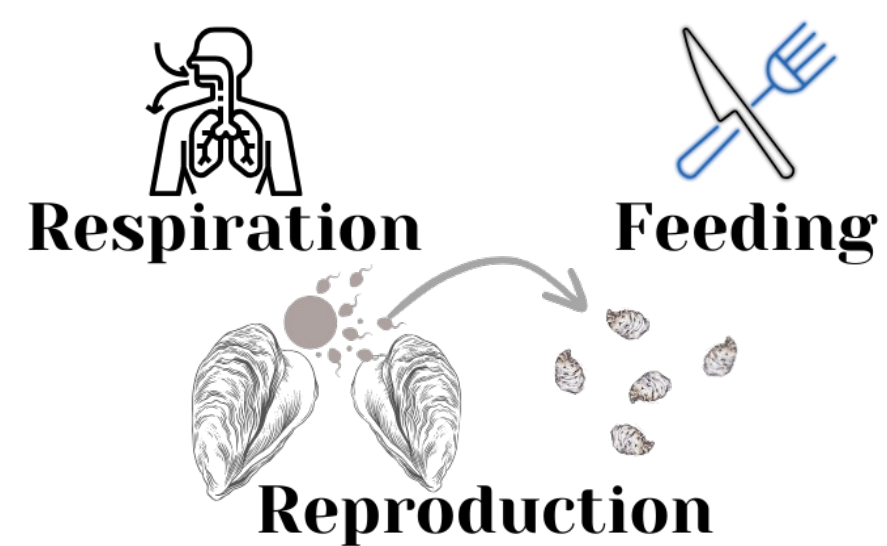
Why should we care about oysters?



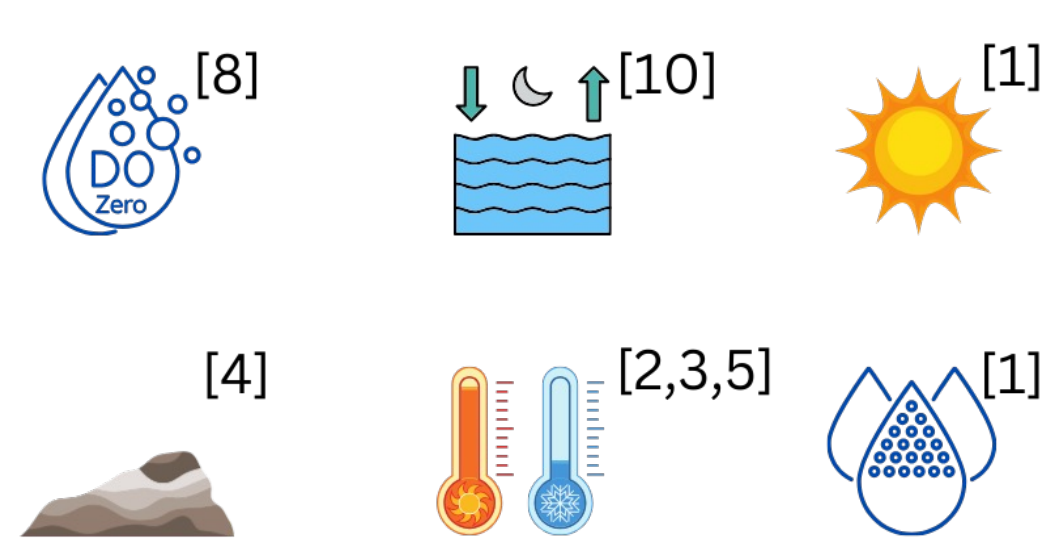
Gaping: Opening and closing of shells



Why do oysters gape?



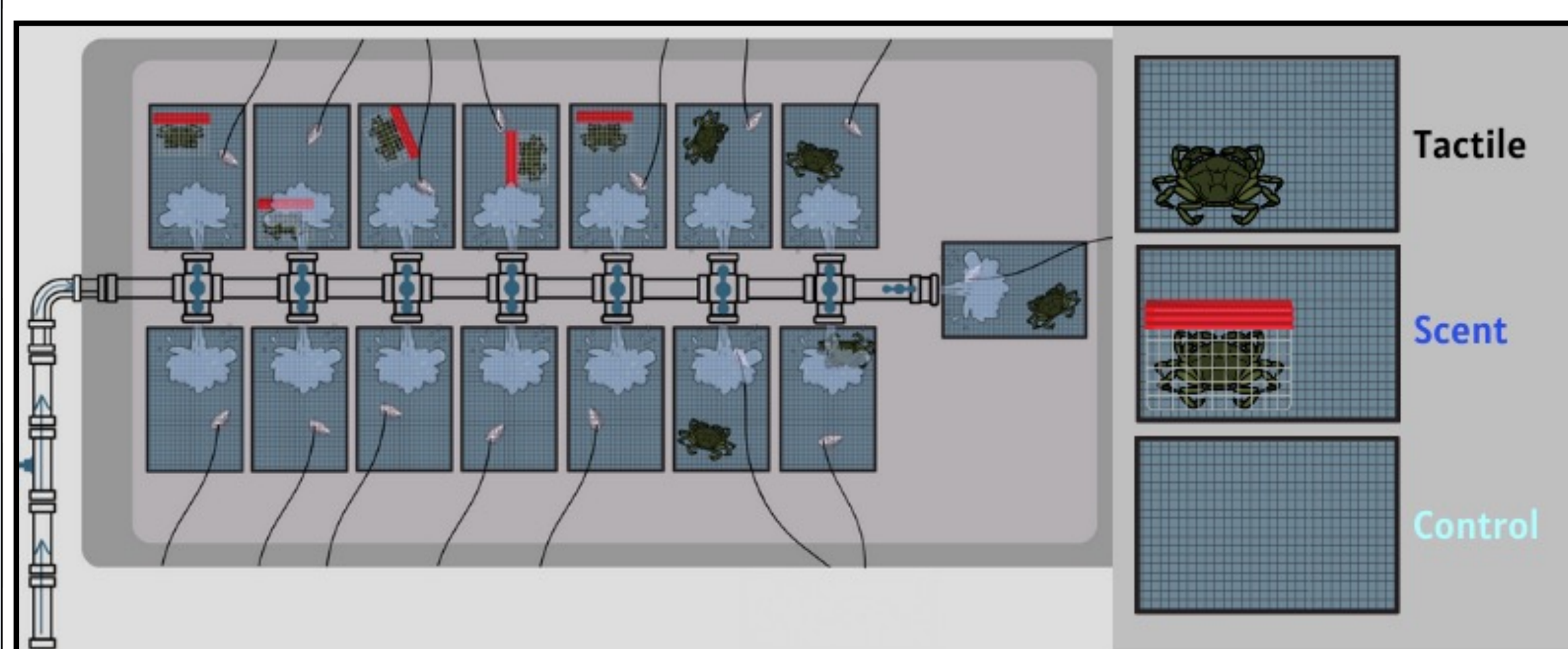
Known Influences on Gaping



The goal of this study:

- Identify the impact of invasive European green crabs, on Eastern oysters.
- Specifically looking at how different types of non-consumptive green crab interactions impact the gaping activity of juvenile Eastern oysters.

Methods



- Conducted at Jackson Estuarine Laboratory (JEL) Fall 2023.
- 5 oysters per treatment: each oyster was in a separate tank
- Behavior was monitored using Hall effect sensors:
 - Sensors were adhered to the shells of each oyster.
 - Gaping behavior was collected every 12 seconds for 58 days.
- Oyster length was measured at the beginning and end of the study for morphological comparison.

Results

Juvenile oysters spent a greater amount of time open in response to tactile crab cues.

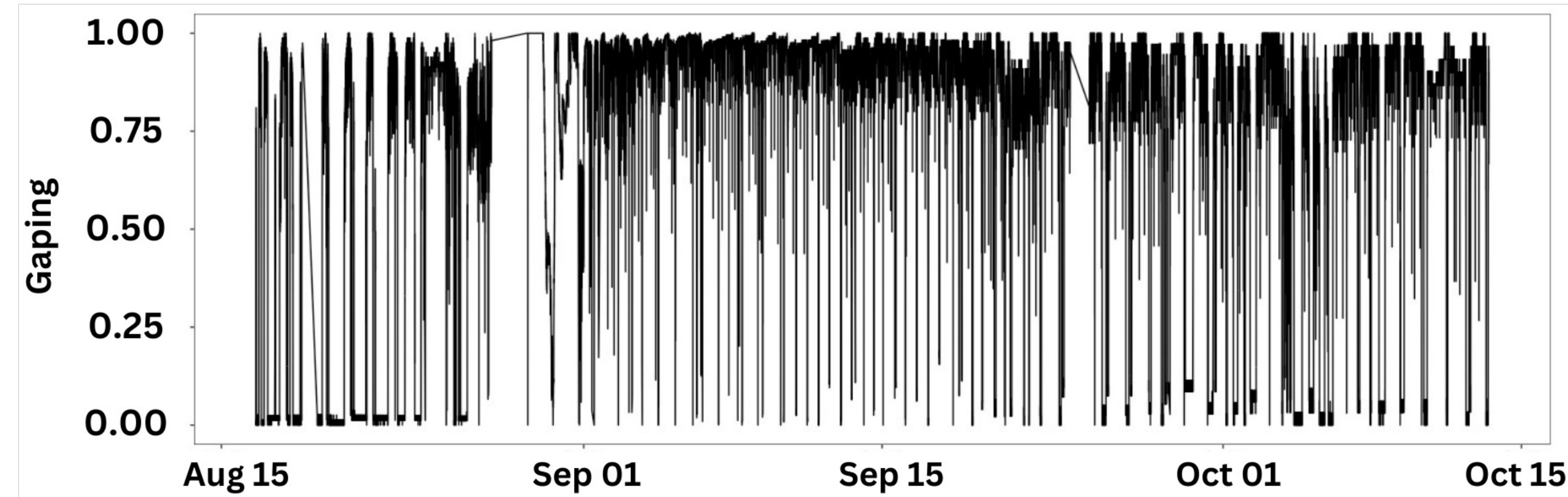


Figure 1. Depiction of a typical oyster gaping response through time. Values of gaping are normalized from Hall effect sensor's raw voltage readings. The gaping range represents fully open (1) and fully closed (0).

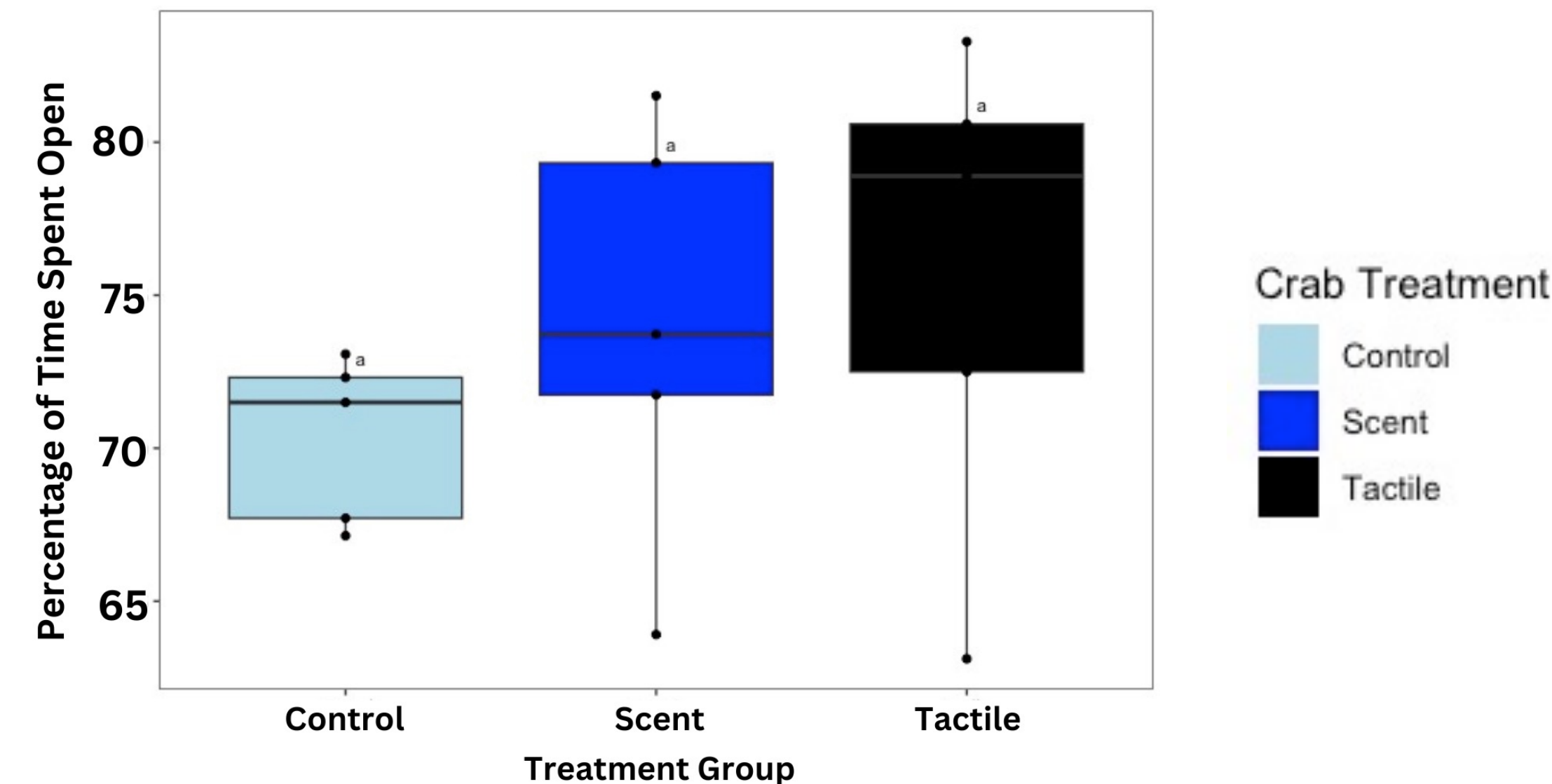


Figure 2. Box plot of percent time individual oysters were open by predator cue treatment, over the 58-day duration. Open was calculated as any value above 0.2.

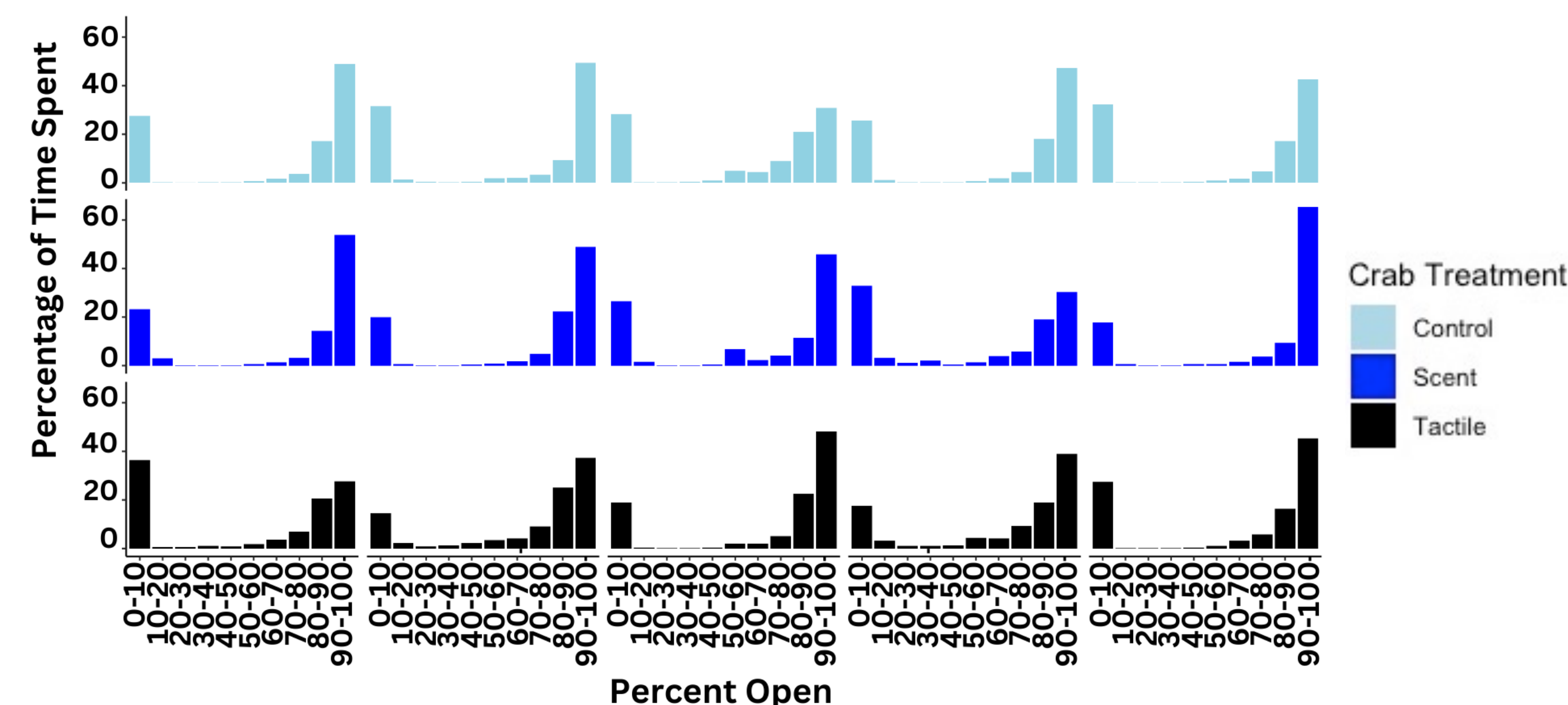


Figure 3. Gaping activity over the duration of the experiment for all individuals. Bins are based on percentage open out of 100 (completely open). For each group time spent partially open was: 27% for control and scent and 37% for tactile.

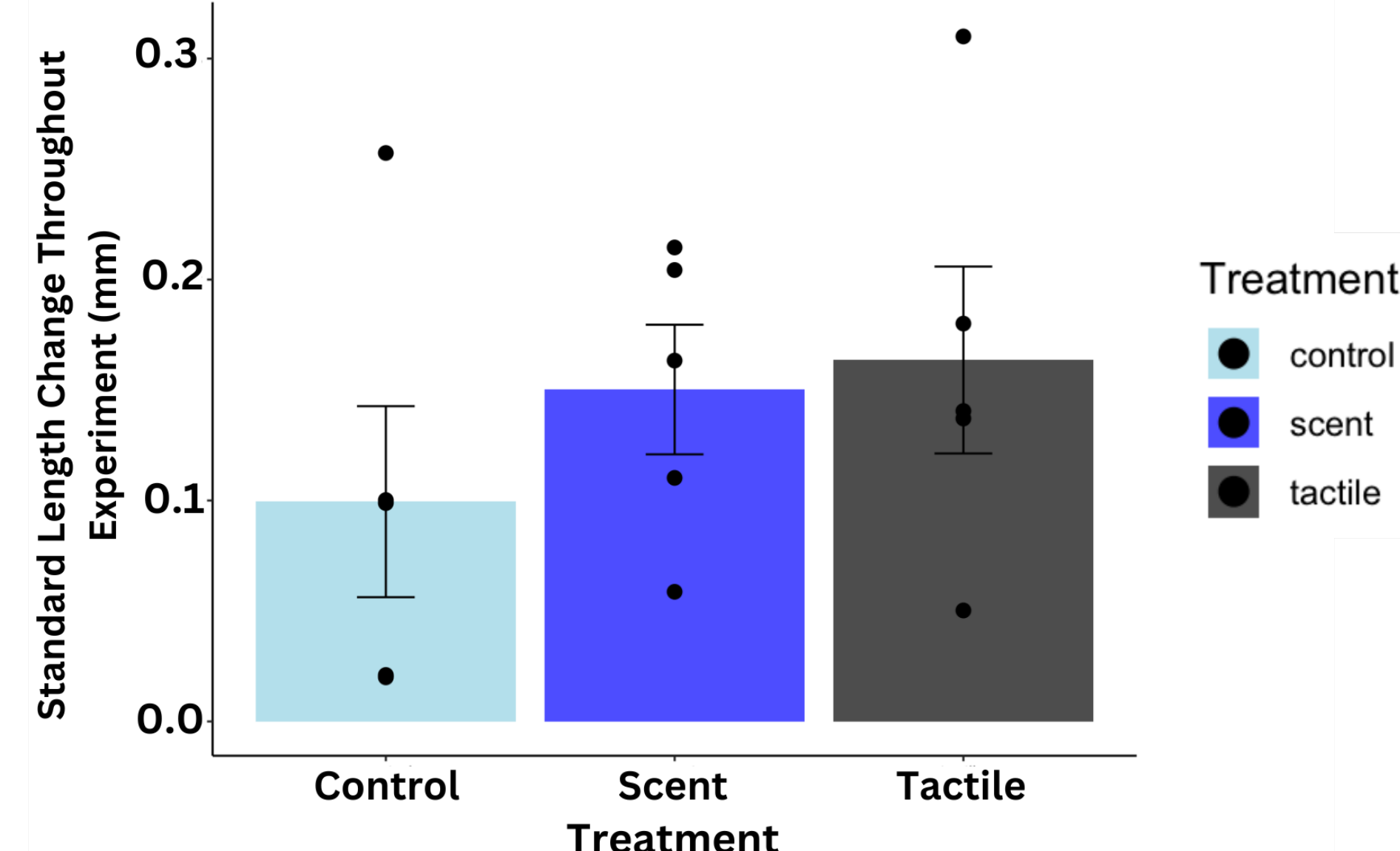


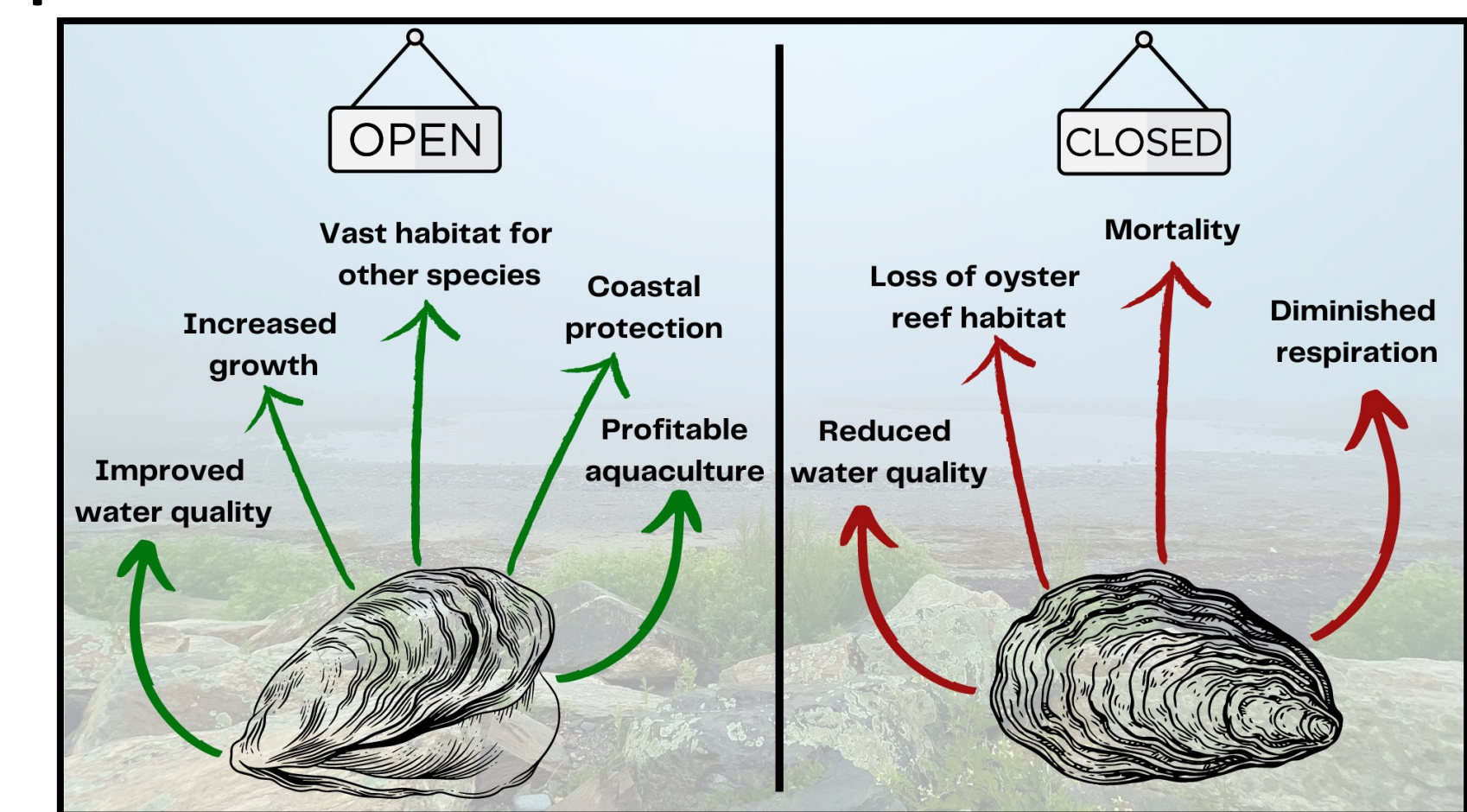
Figure 4. Shell growth over experiment by treatment. Oyster length collected at the beginning and end of the experiment, and length change was standardized. Error bars represent standard error.

Discussion

Interpretation:

- Oysters within the tactile crab treatment spent the most amount of time partially open, and scent group spent the most amount of time fully open.
- Scent treatment oysters had the greatest increase in weight, and both crab treatments had greater shell growth than the control group.
- With long-term exposure to green crabs, remaining closed may become an ineffective defense strategy. Increasing gaping can be seen to increase shell growth, and this morphological change has been found to increase survival relating to other crab species⁽⁹⁾.

Broader Impacts:



Future Research:

- Habituation or sensitization over time
- Activity level throughout the day: when they are most active
- Morphological connection to gaping:
 - Investigate adductor muscle use and enzyme composition
 - Shell density in relation to increased growth rate in crab groups
- Impact of increasing time spent open on energy costs and organism stress

Photos from Study



Acknowledgements

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