

Tumbling Through Time: Oyster (*Crassostrea gigas*) Metabolic Response to Mechanical Stress



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Background

- Oysters are an incredibly important industry in Washington State.
- Tumbling, a form of mechanical stress is used to promote growth and a deeper cup shape.

This study aims to better understand the influence mechanical stress on oyster metabolism over age and time.

Hypothesis

Research Question: How does oyster metabolism change with mechanical stress over size and time?

Ho: There is no difference in metabolic rate following mechanical stress and no differences based on size

Ha: Larger oysters will exhibit lower metabolic rates with a delayed effect of mechanical stress

Methodology

- Oyster seed were obtained from Jamestown Seafood
- Samples were shaken for 20 minutes and then placed in resazurin along with a control group for 4 hours
- Two size classes were used, small (6mm) and large (9mm)

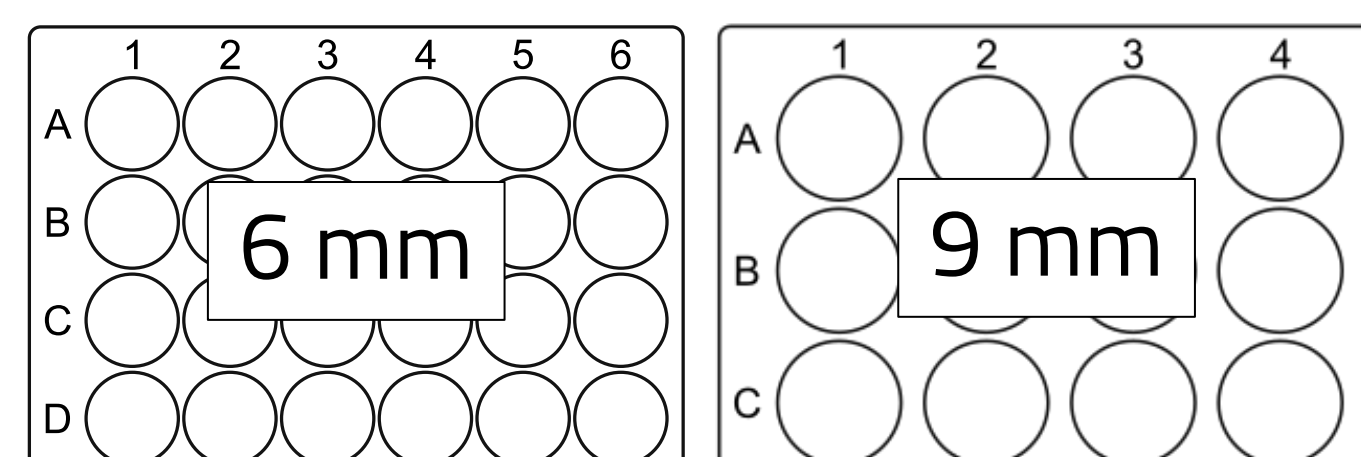


180 Oysters



180 Oysters

Day 0 → Day 3 → Day 7



Large Oysters Exhibited Higher Stress on Day 7

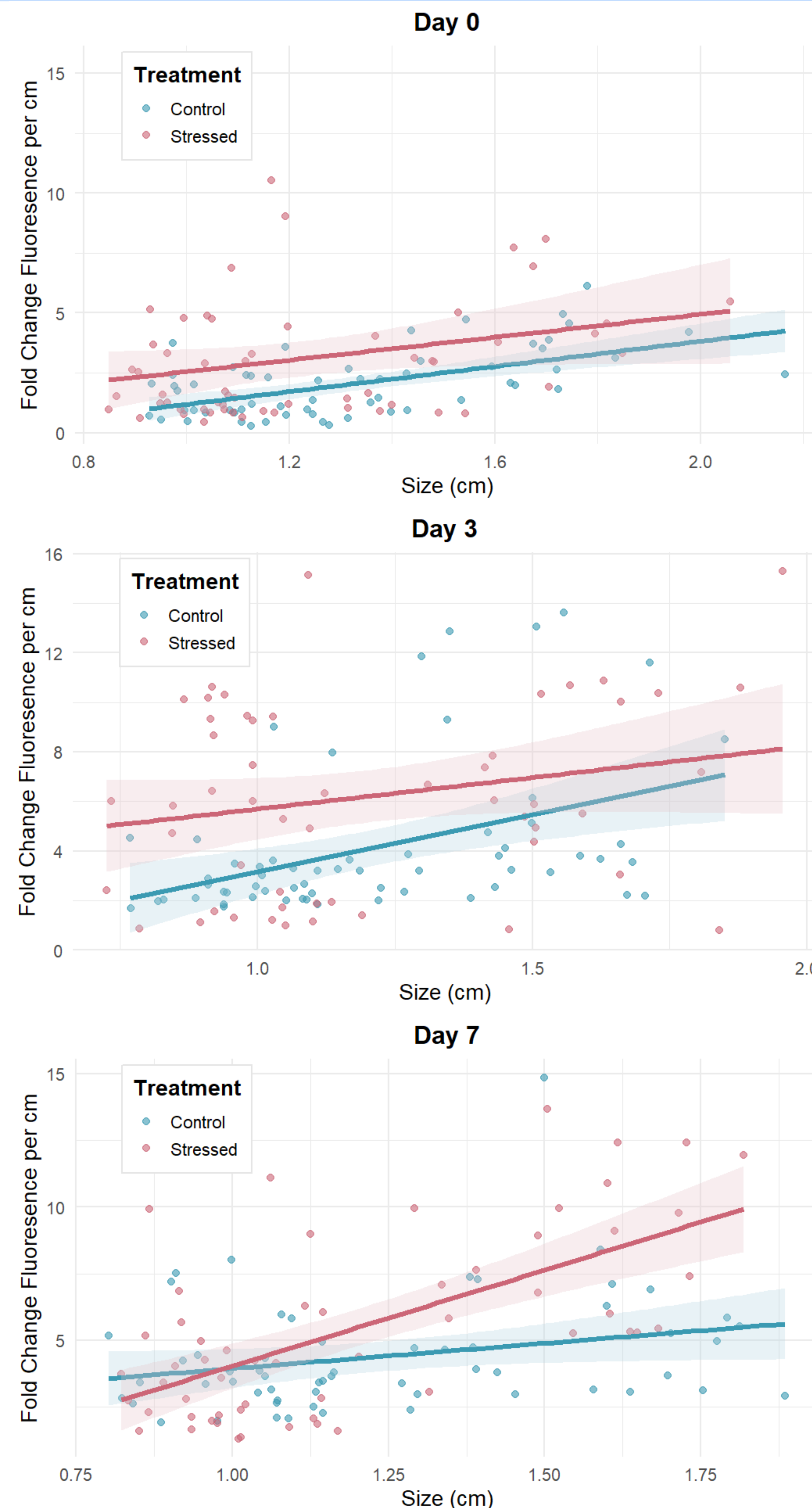


Figure 1 Oyster metabolic rate through fluorescence standardized by size with comparison to size. A linear regression is shown for each treatment with confidence intervals shown in highlighted sections. Data was taken the day of the stress (1A), three days after the stress (1B), and a week after the stress (1C).

Results & Discussion

Larger Oysters showed increased metabolic activity and stress only by Day 7 (two-way ANOVA)

- Day 0: p-value = 0.85874
- Day 3: p-value = 0.32918
- Day 7: p-value = 0.000629**

Main conclusion: Larger Oysters exhibited a delayed metabolic effect after being exposed to intense mechanical stress.

- Results suggest that mechanical stress has a **delayed effect** on the metabolic rate of larger oysters
- Smaller oysters (6mm) did not show any response to mechanical stress
- The higher metabolic rate may **indicate a higher energetic demand** thus **potentially higher stress**. Future research should investigate how this impacts performance and resilience

Future Research

The delayed stress response seen in larger oysters may be a result of an **adrenaline-like hormone response immediately following the stress** (Lacoste et al., 2002). Further and more in-depth research should study the oysters direct physiological response

As climate change continues, further research should investigate the **potential combined impact** of mechanical and temperature stress on oyster metabolism and survival

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