The Effect of low salinity on Juvenile Bay Scallops (Argopecten irradians)

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Introduction

- This project aims to identify how salinity affects juvenile bay scallops to further understand how increased rainfall and runoff could affect their survival and behavior. As we spawn and raise scallops inside a hatchery with the intention of releasing them into the wild, it is important to investigate the environmental factors that play a role in the survival of scallop offspring. One of these influences, salinity, helps determine the density of seawater and overall controls the movement of currents. Salinity is the quality of saline, dissolved into a body of water. Scallops are marine animals that thrive in high salinity areas, this is crucial as they cannot fully close their shells and regulate fresh water. Remaining partially open also allows the scallops to use their byssal threads and foot to climb their habitat and evade predators. To test the salinity tolerance of the hatchery born spat, four trials were run on 120 spat by placing them into four different containers each containing different levels of salinity. The stick, climb, and death rate of the scallops in each solution were recorded.

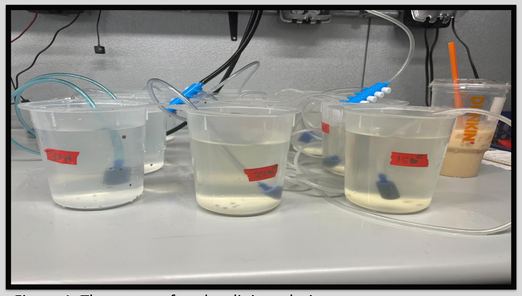
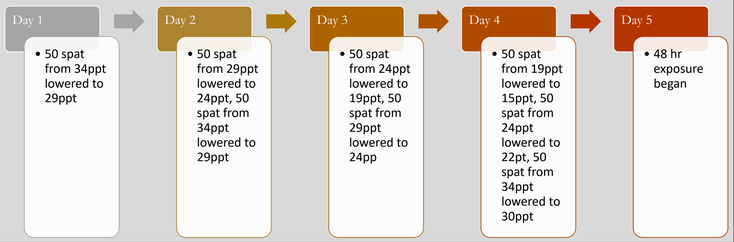


Figure 1. The set up of each salinity solution.

Methods

- 1000mL cups were filled with 800mL of seawater corresponding to the salinity treatment of 30, 22, and 15 ppt. Reversed osmosis water was used for dilutions
- An air stone was placed in each cup to ensure proper oxygen levels for the spat.
- Spat were slowly acclimated to lower salinities to avoid shock (see table 1)
- The experiment consisted of 4 replicates per salinity treatment
- Cups were placed inside the FSUCML's broodstock room
- 10 scallops between 3mm-3.5mm were placed in each cup
- Fed live algae daily at a concentration of 150K cell/ml
- The cups were stirred for 15 seconds before water change and climber, stickers, and dead spat was recorded



Results

• Scallop stick reaction to change in salinity.

o As the salinity decreases, the scallops show a decrease in using their byssal threads to stick on surfaces. As shown here, most scallops do not stick to the cup in 15ppt. This means in lower salinities, the spat may fall off the blades of seagrass they use to hide from predators, making them more susceptible to predation.

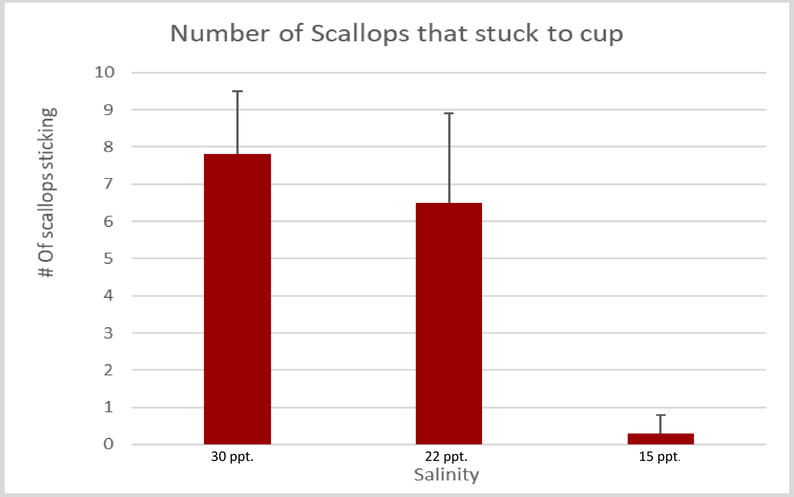


Figure 2. Change in # of scallops sticking to the cup

• Scallop climb reaction to change in salinity.

o As the salinity decreases, the scallops show a decrease in using their foot to climb up the sides of the cup the spats' ability to use their tentacles to climb surfaces also decreases.

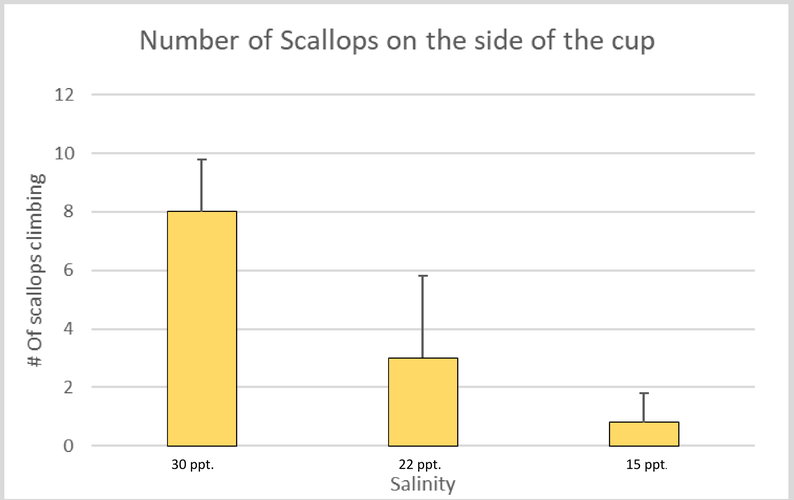


Figure 3. Change in # of scallops climbing on the cup

• Scallop death as a result of salinity change.

o Out of 120 spat tested in the experiment, one trial, 15 ppt B, resulted in the mortality of one scallop.

Conclusion

- The lower salinity treatments resulted in reduced use of juvenile bay scallops' foot and byssal threads. The result of a decrease in climbing and sticking for scallops suggests the spat are remaining closed for longer periods of time in the lower salinity solutions. This would make the scallops more susceptible to predators in the wild if they are unable to climb as a way of escaping by hiding on seagrass blades or macroalgae. The scallops remained shut for most time in the solution as their bodies have a difficult time regulating fresh water in their cells. This time remaining closed directly correlates with a lower feed rate for the scallops, as we can see in the photos of the colors of each solution. This may suggest a slower growth rate as the scallops aren't feeding as often, but further investigation is needed. However, from the experiment, we cannot say that the change of salt water to a salinity of 15 ppt would contribute to a rise in the mortality rate of scallops in the wild.

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References

- Bert, Theresa M. 2014. Florida Gulf Bay Scallop (*Argopecten Irradians Concentricus*) Population Genetic Structure: Form, Variation, and Influential Factors. *Journal of Shellfish Research,* 33(1), p.99-136.
- Khlebovich, & Aladin, N. V. (2010). The Salinity Factor In Animal Life. *Herald Of The Russian Academy Of Sciences*, *80*(3), 299–304.
- Oesterling, Michael J. 1998. Bay Scallop Culture. *Virginia Institute of Marine Science, College of William and Mary*, vol 67, p.97-100
- White, McCorkle, D. C., Mullineaux, L. S., & Cohen, A. L. (2013). Early Exposure Of Bay Scallops (Argopecten Irradians) To High CO_2 Causes A Decrease In Larval Shell Growth. *PloS One*, 8(4).