VIRGINIA FISHERY RESOURCE GRANT (FRG) PROGRAM
FINAL REPORT

FRG 2022-03

Use of bottom and surface culture growing methods to evaluate product line variations on an oyster aquaculture farm

Final Report

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Introduction

Intensive aquaculture is the practice of raising oysters in containers through their life cycle to market. In Virginia, intensive aquaculture is dominated by two basic practices. Bottom cages and surface floats. The later has evolved considerably over the last decade to designs which aim to utilize water flow and surface currents to enhance growth and marketability of the oyster. There are costs and tradeoffs in both practices, and the challenge for any new farmer is to determine which practice is cost effective and fits their business model best. Ultimately, a farmer wants to yield the most volume at the highest price for the lowest cost. Availability of capital to invest, lease location, and permits all contribute to the decision-making process. Equally important is the question as to whether the expense of one practice over another is justified given sales volume and price point of oysters sold at market.

Farm Application

The Cappahosic Oyster Company raises more than 3 million seed annually in a combination of floating and cage-based apparatus. In 2015, the farm invested heavily in double stacked bottom cages as a start-up. This practice of aquaculture has expanded and continues today on the farm. However, a small inventory of floating bag cages, were added two years prior to this project to explore the potential of using this gear type. Cost, permits and daily management of floating gear were all considered as part of the acquisition. While the economics and cost recovery of these two gear types is not being addressed in this study, the quality of oysters produced is being observed and measured through a series of metrics.

Project Purpose

The purpose of the project is to compare a series of metrics between oysters raised in floating apparatus versus those raised in bottom cages. The Cappahosic Oyster company uses two different growing methods on their farm which have been founds to produce two markedly different products to brand. Therefore, the farm presented a unique opportunity to compare two very different growing practices through measuring various metrics Does growth and survival rates differ between the two? This study allowed us to get a more accurate, quantifiable picture of how the two different product lines vary; if in fact they do.

The intention of this study was not to identify one practice as being better than another. Rather the goal was to provide added information for future and current commercial farmers. By design, the study removes farm size and location from the equation and creates a level playing field within which to evaluate and compare critical attributes that will help growers assess their own risk tolerance and develop a better business plan with respect to gear type selection, product line expansion, and marketability.

Study Design

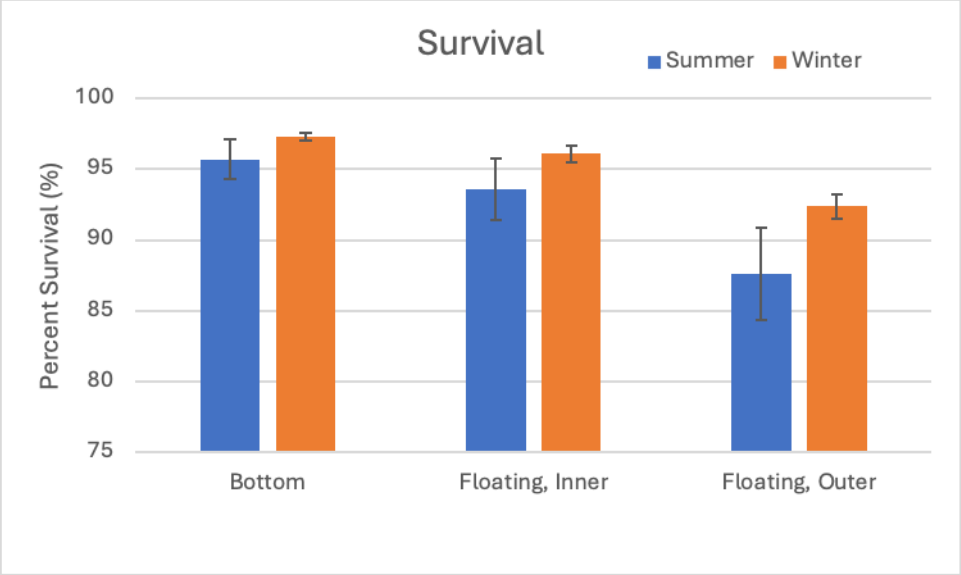
The project divided a population of oyster seed raised together in tank-based upwellers between floating bag cages, bottom bag cages and bottom cages. The average size of the oysters upon transfer was 25 mm. All containers were deployed in a single line array and on the same lease in the York River in fall 2021. Oysters were raised to market size while undergoing normal husbandry practices that include grading and sorting through the life cycle. During specific intervals throughout their growth cycle, approximately 30 sample oysters were removed from each and measured for specific metrics. This process occurred several times throughout the study, with a final sampling in Feb. 2023.

The metrics can be loosely divided into three categories: 1) Yield (growth and survival); 2) 'Quality' (e.g., shell shape, meatiness, etc.); 3) Consumer Satisfaction. Metrics associated with Yield and Quality included: growth and survival, shell shape, meat fullness, shelf life, and cleanliness. Consumer satisfaction metrics included shelf life, willingness to pay, taste, and appearance. These were assessed after oysters reached market size later in the study.

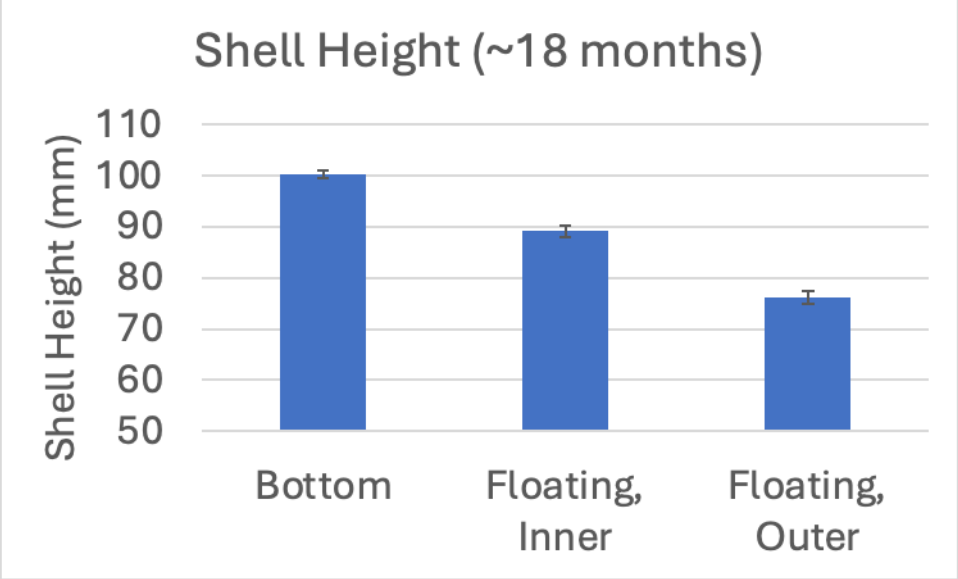
The study used electronic scales and handheld measuring devices such as calipers to assess size and shape, and scientific and industry indices for assessing meatiness. Additional measurement and classification indices were also be applied. The work was supplemented with a restaurant survey of raw oyster consumers in Aug. 2023 with oysters raised with similar methods. In addition, an analysis of shelf life using market ready oysters was performed over nearly 4 weeks to assess shelf life differences between the growing techniques.

Summary of Findings

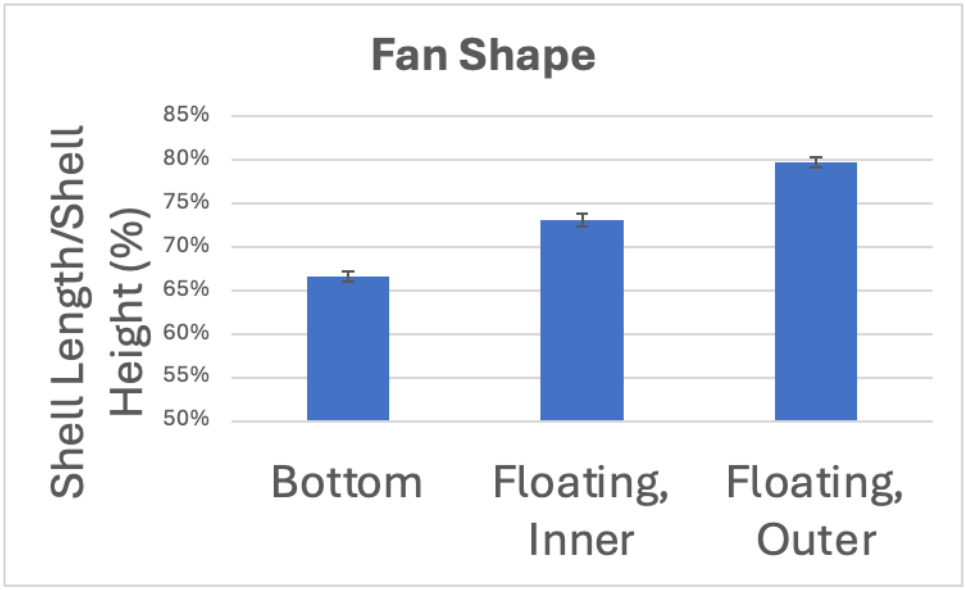
In this study, bottom cages (BC) were compared to two positions in flippable, floating cages: bags in the four outer positions, designated FO, and bags in the two inner positions, designated FI (given prior qualitative observations of differences). While overall survival was good (≥87%,) survival was lower in the FO treatment than survival in the BC and FI treatments.

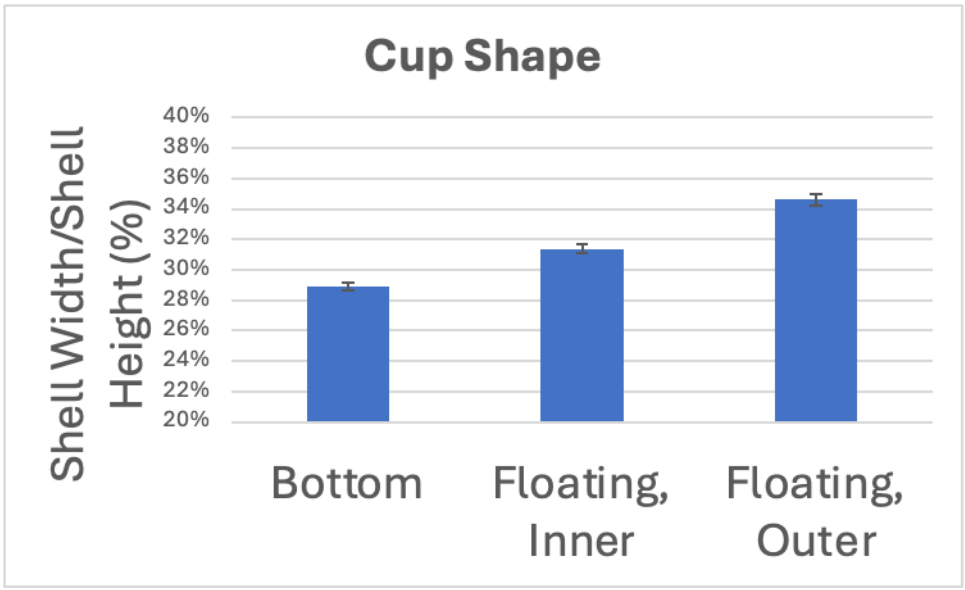


Growth was highest in BC, followed by FI and F), respectively.

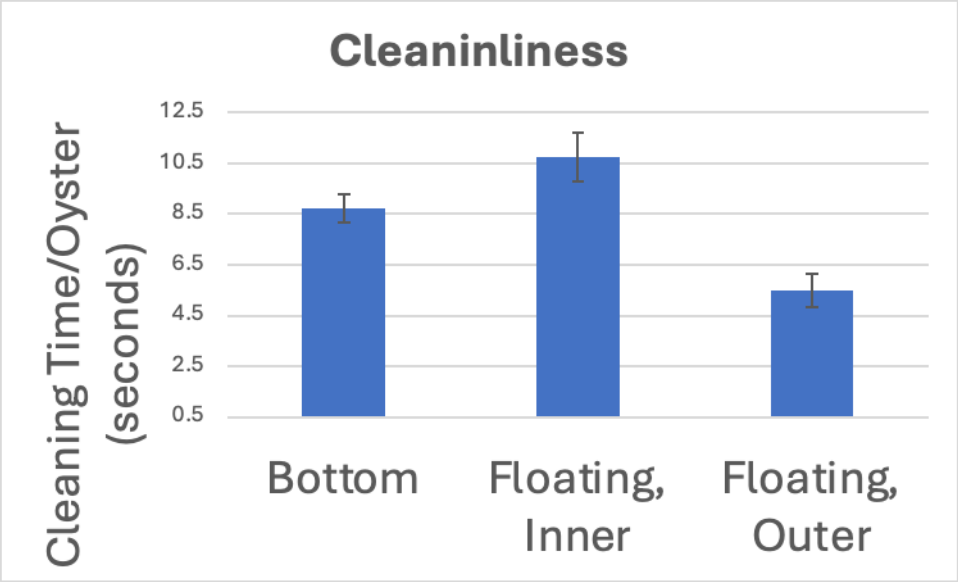


In contrast, oysters raised in the FO treatment had the greatest shell fan ratio (shell height/shell length) and shell cup ratio (shell width/shell length) of all the treatments, meaning these oysters had the broadest fans and deepest cups on average.

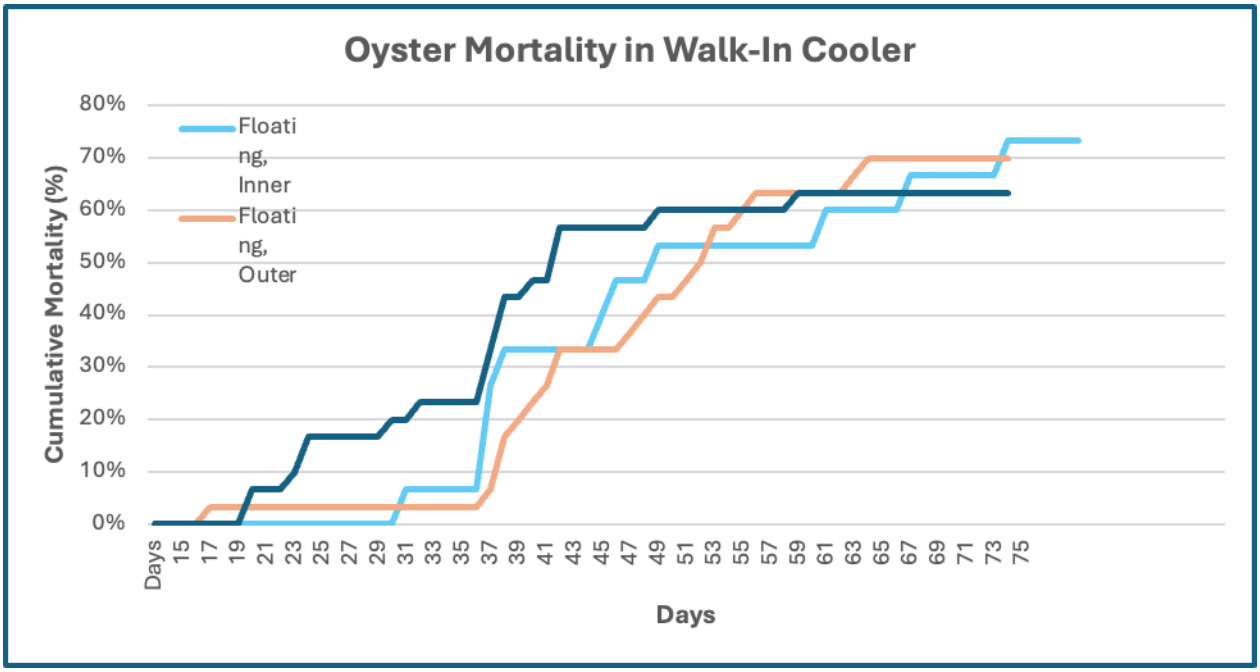




Additionally, the oysters raised in the FO treatment were the easiest to clean of biofouling.



In a test of shelf life during summer (using oysters raised with identical methods), FO oysters had the longest shelf life while BC oysters had the shortest. Notably, mortality was not observed in any treatment until 19 days into the experiment, with substantial mortality observed in all treatments after ~35 days (5 weeks).



Despite these measured differences in what might be considered metrics of quality, in a preliminary restaurant survey in summer 2023 at Casa Pearl in Williamsburg, VA, BC oysters were requested more frequently by consumers (46%) in a blind taste than oysters from FI (38%) and FO (17%), respectively.

Conclusion

These results suggest that there are tradeoffs between these two methods that growers may want to consider in their particular circumstances. This study also does not take into considerations other important factors such as cost, labor, permitting issues, etc. Despite these limitations, these results may help growers make more informed decisions when opting for a particular gear type.