TECHNIQUES TO IMPROVE PRODUCTION OF OFF-BOTTOM CULTURED OYSTERS

Reporting period

June 1, 2017 – October 31, 2019

Funding level Year 1……………………….…………$77,882
Year 2……………………….………....$90,694
Total…………………….……….....$168,576

Participants South Carolina Sea Grant Consortium……..Julie Davis, Project Leader
University of Georgia…… ………………..Thomas Bliss, Robert Bringolf
University of Florida………………………Leslie Strumer
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Auburn University…………………………William Walton
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OBJECTIVES

The objectives of this project are to:

1) Determine the impacts of cage manipulation to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).
2) Determine the impacts of antifouling agents to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).
3) Determine the economic impact of each methodology on production costs.

ANTICIPATED BENEFITS

The benefits associated with fine tuning methods to control biofouling when using the OysterGro™ system to grow high value single oysters include: reduced labor costs, improved product quality, improved yield, and shorter grow-out time. The methods used commercially today by the emerging oyster aquaculture industry in the Southern US are effective, however, reducing or increasing the frequency of aerial drying and/or applying a fouling release coating could improve the profit margin of the business without impacting or improving product quality. These benefits will allow growers within the Southern US to grow their businesses quicker and take advantage of strong and expanding markets for high value single oysters.

PROGRESS AND PRINCIPAL ACOMPLISHMENTS

Within the first project reporting period (May-August 2017) our team was gearing up for deployment of our experiment in each state. Deployment of the experiment happened in September 2017. Each state's report follows, some more detailed than others as each partner's responsibilities pre-deployment varied.

Within the second project reporting period (September 2017-August 2018) our team deployed the experiment in each state and completed quarterly sampling. The industry partner in each state was responsible for adhering to the flipping routine. On the Gulf Coast the field component of the experiment was also completed during the reporting period because greater than 70% of the oysters in the bi-weekly flipping treatment had reached harvest size and the gear had been exposed to what is considered the heavy fouling season. The field component of the project on Gulf Coast was terminated in June 2018 with harvesting of the product and final sampling. On the Atlantic Coast, by June 2018, 70% or more of the oysters in the bi-weekly flipping treatment had reached harvest size in North Carolina and South Carolina within the reporting period. In Georgia, however, the oysters were smaller. As of June 2018, the gear in each Atlantic state had not been exposed to what would be considered a heavy fouling season (i.e. summer). The decision was made to treat the June sampling trip as a 'harvest' sampling for NC and SC. At that time the densities were reduced in each bag as outlined in our proposal and the experimental treatments continued to be applied until the one-year post-deployment time. Sample processing for the Gulf States commenced during the reporting period and carried on into 2019, as did sample processing for the Atlantic States. Each state's report follows and is very similar as the graduate students would travel to each state over the course of two weeks to completed each sampling.

Louisiana Report – Supan/Callam

Objective 1: Determine the impacts of cage manipulation to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Triploid oysters to be used in the Gulf States were spawned for this project in May 2017. Seed was nursed at the Louisiana State University/LA Sea Grant Oyster Research Laboratory until it could be received in Alabama and Florida. Disease certification of the seed was done in June 2017 and seed transfer took place in July 2017 to the Auburn University Shellfish Lab to be further nursed to grow out size for subsequent deployment in Mississippi and Alabama. Seed transfer to Florida occurred in August 2017, where they were further nursed until deployment. A graduate student was hired to conduct the project. Mr. Ellis Chapman is a masters student at LSU and will assist with all field sampling, data collection, and data analysis for the project in the Gulf States.

Mooring tackle for cage deployment was procured. Industry partner and deployment location finalized.

In September 2017, 12 cages were deployed at Grand Isle, LA per the experimental design aid out in our proposal. A subsample of at least 100 oysters placed in the cages was saved for future analysis of start size shell metrics. Quarterly sampling took place in December 2017, March 2018, and June 2018. At each quarterly sampling, shell metrics (shell height, length and width) of 10 oysters from each bag were collected. In addition to oyster metrics, during each quarterly sampling trip a photo of a standardized location on the bag was captured for future analysis of the degree of fouling based on flipping routine and/or coating treatment. In May 2018, based on

March 2018 data and weekly observations by industry partners, the decision was made to terminate the field portion of the project in June 2018. A conference call amongst PIs determined that the cages had been exposed to a heavy fouling period and no further knowledge regarding the effectiveness of fouling control techniques would be gained from a density reduction and continuation to the one-year post-deployment date. The June 'harvest sampling' trip involved removing, without bias, 25 oysters from each bag for freezing and future measurement of shell metrics, condition index, and fouling. The remaining oysters were left in the care of the industry partner.

Objective 2: Determine the impacts of antifouling agents to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Same as above for objective 1.

Objective 3: Determine the economic impact of each methodology on production costs.

No progress within the reporting period.

Mississippi/Alabama Report - Walton

Objective 1: Determine the impacts of cage manipulation to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Approximately 30,000 triploid seed was received from LSU on July 2017. The seed was nursed to grow out size at the Auburn University Shellfish Lab for subsequent deployment in Mississippi and Alabama. Mooring tackle for cage deployment was procured. Industry partners and deployment locations were finalized.

In September 2017, 12 cages were deployed at Navy Cove Oyster Company, Fort Morgan, AL and Deer Island, MS per the experimental design aid out in our proposal. A subsample of at least 100 oysters placed in the cages was saved for future analysis of start size shell metrics. Quarterly sampling took place in December 2017, March 2018, and June 2018. At each quarterly sampling, shell metrics (shell height, length and width) of 10 oysters from each bag were collected. In addition to oyster metrics, during each quarterly sampling trip a photo of a standardized location on the bag was captured for future analysis of the degree of fouling based on flipping routine and/or coating treatment. In May 2018, based on March 2018 data and weekly observations by industry partners, the decision was made to terminate the field portion of the project in June 2018. A conference call amongst PIs determined that the cages had been exposed to a heavy fouling period and no further knowledge regarding the effectiveness of fouling control techniques would be gained from a density reduction and continuation to the one-year post-deployment date. The June 'harvest sampling' trip involved removing, without bias, 25 oysters from each bag for freezing and future measurement of shell metrics, condition index, and fouling. The remaining oysters were left in the care of the industry partner.

Objective 2: Determine the impacts of antifouling agents to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Same as above for objective 1.

Objective 3: Determine the economic impact of each methodology on production costs.

No progress within the reporting period.

Florida Report - Sturmer

Objective 1: Determine the impacts of cage manipulation to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Approximately 15,000 triploid seed were received from LSU in August 2017. The seed was nursed to grow out size for deployment in September 2017. Mooring tackle for cage deployment was procured. Industry partner and deployment location was finalized.

In September 2017, 12 cages were deployed at Cedar Key, FL per the experimental design aid out in our proposal. A subsample of at least 100 oysters placed in the cages was saved for future analysis of start size shell metrics. Quarterly sampling took place in December 2017, March 2018, and June 2018. At each quarterly sampling, shell metrics (shell height, length and width) of 10 oysters from each bag were collected. In addition to oyster metrics, during each quarterly sampling trip a photo of a standardized location on the bag was captured for future analysis of the degree of fouling based on flipping routine and/or coating treatment. In May 2018, based on March 2018 data and weekly observations by industry partners, the decision was made to terminate the field portion of the project in June 2018. A conference call amongst PIs determined that the cages had been exposed to a heavy fouling period and no further knowledge regarding the effectiveness of fouling control techniques would be gained from a density reduction and continuation to the one-year post-deployment date. The June 'harvest sampling' trip involved removing, without bias, 25 oysters from each bag for freezing and future measurement of shell metrics, condition index, and fouling. The remaining oysters were left in the care of the industry partner.

Objective 2: Determine the impacts of antifouling agents to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Same as above for objective 1.

Objective 3: Determine the economic impact of each methodology on production costs.

No progress within the reporting period.

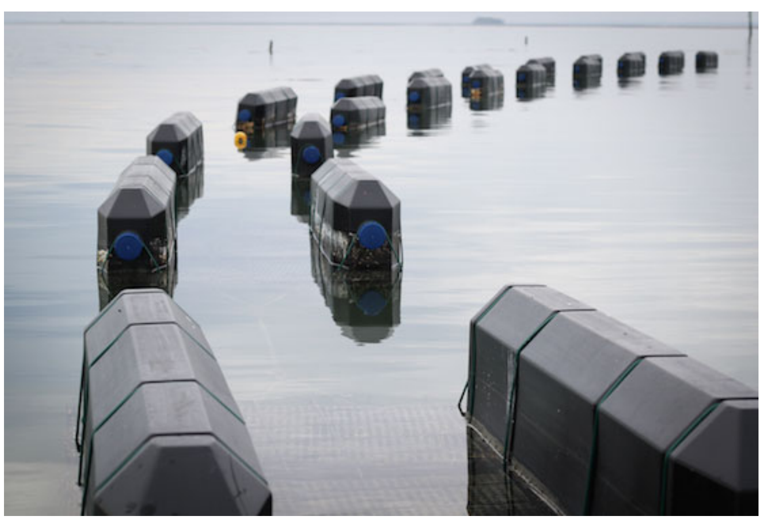
Georgia Report - Bliss

Objective 1: Determine the impacts of cage manipulation to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Mooring tackle for cage deployment was procured. University of Georgia MAREX/GA Sea Grant Extension agent Rob Hein assisted bag construction and applying fouling release coating to bags in July and August of 2017. Industry partner and deployment location was finalized.

A graduate student was hired to conduct the project. Ms. Shannon Kirk is a masters student at UGA and will assist with all field sampling, data collection, and data analysis for the project in the Atlantic States.

In September 2017, 12 cages were deployed at the UGA Demonstration Site, Skidaway Island, GA per the experimental design aid out in our proposal. A subsample of at least 100 oysters placed in the cages was saved for future analysis of start size shell metrics. Quarterly sampling took place in December 2017, March 2018, and June 2018. At each quarterly sampling, shell metrics (shell height, length and width) of 10 oysters from each bag were collected. In addition to oyster metrics, during each quarterly sampling trip a photo of a standardized location on the bag was captured for future analysis of the degree of fouling based on flipping routine and/or coating treatment. In May 2018, based on March 2018 data and weekly observations by industry partners, the decision was made to treat the June 2018 sampling as a 'harvest sampling' in order to coordinate with the fact that oysters in NC and SC had reached harvest size. A conference call amongst PIs determined that the cages had not exposed to a heavy fouling period and we would, therefore, continue, at reduced densities, to apply the experimental treatments through until the one-year post-deployment date (October 2018). The June 'harvest sampling' trip involved removing, without bias, 15 oysters from each bag for freezing and future measurement of shell metrics, condition index, and fouling. The remaining oysters were left in the care of the industry partner, with 50 oysters per bag remaining in each cage to be assessed at the one-year post-deployment date.



OysterGro cages in Georgia.

Objective 2: Determine the impacts of antifouling agents to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Same as above for objective 1.

Objective 3: Determine the economic impact of each methodology on production costs.

No progress within the reporting period.

South Carolina Report - Davis

Objective 1: Determine the impacts of cage manipulation to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

During April 2017, Davis coordinated with BBI Group and local dealers on procurement of the cages and bags required in each state for the project. From May-July 2017, Davis worked with Netminder to acquire the currently commercially available fouling release coating to use for the study. Davis also agreed to contract terms and signed a contract with Popoff Enterprises for production of two educational oyster farming videos.

The OysterGro™ dealers in the Gulf (Double D) and Atlantic (Lady's Island) received the cages, bags, and coating. They were responsible, with assistance from project PIs, for final construction on the cages and bags and applying the coating. In SC, this took place in July and August 2017. This occurred outside of the reporting period in the Gulf states.

Triploid oysters to be used in the Atlantic States were spawned for this project in May 2017, in partnership with Lady's Island Oyster, Inc. Seed was nursed at Lady's Island Oyster until it ready for deployment in North Carolina, South Carolina and Georgia. Disease certification of the seed was completed in August 2017 and seed transfer to NC and GA took place immediately prior to cage deployment in September 2017.

Mooring tackle for the cages was acquired. Industry partner and deployment location was finalized.

In September 2017, 12 cages were deployed at Lady's Island Oyster Inc., Beaufort, SC per the experimental design laid out in our proposal. A subsample of at least 100 oysters placed in the cages was saved for future analysis of start size shell metrics. Quarterly sampling took place in December 2017, March 2018, and June 2018. At each quarterly sampling, shell metrics (shell height, length and width) of 10 oysters from each bag were collected. In addition to oyster metrics, during each quarterly sampling trip a photo of a standardized location on the bag was captured for future analysis of the degree of fouling based on flipping routine and/or coating treatment. In May 2018, based on March 2018 data and weekly observations by industry partners, the decision was made to harvest the project in June 2018 because 70% or more of the oysters in the bi-weekly flipping treatment had reached 76mm. A conference call amongst PIs determined that the cages had not exposed to a heavy fouling period and we would, therefore, continue, at reduced densities, to apply the experimental treatments through until the one-year post-deployment date (October 2018). The June 'harvest sampling' trip involved removing, without bias, 15 oysters from each bag for freezing and future measurement of shell metrics, condition index, and fouling. The remaining oysters were left in the care of the industry partner, with 50 oysters per bag remaining in each cage to be assessed at the one-year post-deployment date.

Objective 2: Determine the impacts of antifouling agents to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Same as above for objective 1.

Objective 3: Determine the economic impact of each methodology on production costs.

No progress within the reporting period.

North Carolina Report - Weirich

Objective 1: Determine the impacts of cage manipulation to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Mooring tackle for cage deployment was procured. Industry partner and deployment location was finalized.

In September 2017, 12 cages were deployed at Carolina Mariculture, Cedar Island, NC per the experimental design aid out in our proposal. A subsample of at least 100 oysters placed in the cages was saved for future analysis of start size shell metrics. Quarterly sampling took place in December 2017, March 2018, and June 2018. At each quarterly sampling, shell metrics (shell height, length and width) of 10 oysters from each bag were collected. In addition to oyster metrics, during each quarterly sampling trip a photo of a standardized location on the bag was captured for future analysis of the degree of fouling based on flipping routine and/or coating treatment. In May 2018, based on March 2018 data and weekly observations by industry partners, the decision was made to harvest the project in June 2018 because 70% or more of the oysters in the bi-weekly flipping treatment had reached 76mm. A conference call amongst PIs determined that the cages had not exposed to a heavy fouling period and we would, therefore, continue, at reduced densities, to apply the experimental treatments through until the one-year post-deployment date (October 2018). The June 'harvest sampling' trip involved removing, without bias, 15 oysters from each bag for freezing and future measurement of shell metrics, condition index, and fouling. The remaining oysters were left in the care of the industry partner, with 50 oysters per bag remaining in each cage to be assessed at the one-year post-deployment date.

Oysters harvested in June 2018 from Cedar Island, NC.

Objective 2: Determine the impacts of antifouling agents to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Same as above for objective 1.

Objective 3: Determine the economic impact of each methodology on production costs.

No progress within the reporting period.

BBI Group Report - Savoie

Objective 1: Determine the impacts of cage manipulation to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

BBI Group worked with PI Davis and regional OysterGro™ dealers in the Gulf and Southeast to construct and ship 84 cages and 504 bags to the region.

No progress within the second reporting period, obligation complete with regard to this objective in Year One.

Objective 2: Determine the impacts of antifouling agents to decrease biofouling, and evaluate the effects on time to harvest, survival, and morphometric factors, such as meat weight and shell shape (height, length, depth).

Same as above for objective 1.

Objective 3: Determine the economic impact of each methodology on production costs.
No progress within the reporting period.

IMPACTS

During the first reporting period, there are no impacts as the project had yet to be deployed. In the South Atlantic, however, the project realized one significant accomplishment in that as a result of this project, the state of Georgia allowed import of oyster seed with no detectable level of disease into the state. This project also represents the first time floating oyster cages have been permitted for deployment in Georgia and Mississippi.

During the second reporting period, there are no impacts as the project was on-going.

PUBLICATIONS, MANUSCRIPTS, OR PAPERS PRESENTED

No publications, manuscripts or paper were prepared or presented during this reporting period. In May 2017, Marion Laney of Popoff Enterprises visited both South Carolina and Alabama to capture footage for the two videos that will be produced as part of this project. He spent two days in each location and was able to capture different aspects of oyster farming on the Gulf versus Atlantic coasts.

Filming with Popoff Enterprises.

An update on project progress was given at the regional OysterSouth Symposium in Charleston, SC February 2018. This conference attracted nearly 200 people, over 100 of which were growers from throughout the Southern US.

RESULTS AT A GLANCE

Extension, research, and industry partners from throughout the South prepared for synchronized deployment of an experiment to improve production of off-bottom cultured oysters. Preparations included spawning triploid oysters in South Carolina and Louisiana and nursing over 75,000 seed in four states.

Extension specialists and gear dealers built 84 cages, over 500 bags, and coated over 250 bags in preparation for deployment in seven Southern states.

Two masters level graduate students were hired to assist with the SRAC funded project aimed at improving production of off-bottom cultured oysters.

Extension specialists and industry deploy and monitor 84 cages, over 70,000 oyster seed to assess best methods to control biofouling to improve production of premium single oysters when using the OysterGro™ system.

Two masters level graduate students work to monitor performance of oysters in floating cages, determine best fouling control techniques.