Increasing Oyster Production in the Gulf of Mexico: Adopting High-Density Larval Culture at the Auburn University Shellfish Lab

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Established in 2003 to conduct practical research for the shellfish industry
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Background
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Initial Hatchery

- Small-scale hatchery
- Oyster larvae and post-set spat primarily for research
2009 – Interest in off-bottom oyster aquaculture begins in Alabama.

2012 – AUSL establishes an oyster aquaculture training program

2017 – 15 oyster farms operating in Alabama.
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Background

Expanded production capability in 2015
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Larval Production

Larvae distributed (millions)

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Seed Production

Seed Distributed (millions)
Primary products
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Primary products
Increasing Oyster Production
GSMFC Grant Objectives

1. Install high-density larval production system
   a) Increase production capacity
   b) Expand production season
   c) Foster commercial hatchery development
   d) Expanded opportunities for research and restoration
2. **Install continuous algal bag production system**

   a) Provide food for high-density larval system

   b) **Training on growing algae**

   c) **Allow for comparison of live algae vs algae concentrates**
3. Install broodstock conditioning system

a) Improve gamete quality and consistency

b) Expand spawning capabilities outside normal season
Increasing Oyster Production

Static vs High-Density Systems

- Tank Size = 4,000L
- Initial Stocking Density = 10/ml (40 million/tank)
- Harvest Density = 3/ml (12 million/tank)

- Tank Size = 400L
- Initial Stocking Density = 100/ml (40 million/tank)
- Harvest Density = 50/ml (20 million/tank)
Increasing Oyster Production

High-Density Larval System

- Climate controlled room
- High density larval tanks
- Algae reservoir
- Algae delivery lines

- Flow-thru water reservoir
- Fine filtration
- In-line heater
- Water delivery lines
Increasing Oyster Production
High-Density Larval System

- Loop system
- 1μm filter cartridges
- In-line heater
- Mag-drive pump

- Flow-thru water reservoir
- Float control valve
- Pre-filtered water
- Return flow
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High-Density Larval System

- 400L tank
- Banjo screen outlet
- Over-flow

- Over-flow
- Catch screen
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High-Density Larval System

- Water control valve
- Algae feed valve
- Air inlet
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High-Density Larval System

- Algae reservoirs
- Automated feed system for algal concentrates

- Algae delivery pump
- Float switch
- Delivery line from algae lab
Increasing Oyster Production

Algae Bag Production System

Algal Concentrates vs Live Algae

Pros
- Reliably available
- Low cost

Cons
- Settling

Pros
- Live – no settling

Cons
- Space
- Cost
- Personnel
Increasing Oyster Production

Continuous Algal Bag System

- Starter cultures
- Two-step flask cultures
- Red and Blue LED grow lights

- Reinforced floor system
- Bags contained in cages
- Continuous filtered water supply
- Continuous harvest
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Continuous Algal Bag System

- Chlorination tank
- 1μm filter cartridges
- Storage reservoir

- UV sterilization
- 1μm filter cartridge
- Flow to algal bag system
- Return flow to storage reservoir
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Continuous Algal Bag System

- Cage support stand
- Water delivery line
- Algae harvest line
- Algae harvest sump
- Pump to hatchery
- Float switch control
- Steam generator
- Line sterilization
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Continuous Algal Bag System

- Air delivery manifold
- Piston air pump
- 1μm air filtration
- UV sterilizer
- CO₂ injection port
- CO2 source
Increasing Oyster Production

Broodstock Conditioning System

• Enclosed, climate controlled room
• Semi flow-thru/recirculating system
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Broodstock Conditioning System

- Hot/Cold loop for new water
- In-tank heater
- Recirculating pump
- Filter box
- Air supply
- Food supply
- Overflow
Increasing Oyster Production

Broodstock Conditioning System

- Hot/Cold reservoir
- Incoming raw water
- Recirculating loop
- Float valve control
- Air relief valve

- In-line heater
- In-line chiller
Increasing Oyster Production

Broodstock Conditioning System

- Feed System
- Automated peristaltic pump
- Mini-frig
- Algae reservoirs
Increasing Oyster Production
Broodstock Conditioning System

- Programmable feed schedule
- Smart phone functionality
- Up to 150 feedings/24hr
Oyster Hatchery Experience
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Question?