Experimentation of Different Oyster Growing Methods and Spat Retention in Oyster Bay, Florida

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Research Site
Oyster Bay, Florida
WEI 5.5-acre aquaculture research site
Oyster Growing Methods

- **Objective:**
  - Compare OysterGro Floating Cages vs Seapa Hybrid Cages
    - 20,000 Triploid (3n) oysters

- **Measure:**
  - Length
  - Oyster Tissue Dry Weight
  - Practicality of each Growing Method
Oyster Growth
Length vs Days

One Way RM ANOVA
\( F_{(1,109)} = 2.038, \ p = 0.156 \)
*Not Significant

Floating: \( r^2 = 0.68, \ p < 0.001; \ y = 23.7 + 10.11 \ln x \)
Seapa: \( r^2 = 0.68, \ p < 0.001; \ y = 23.7 + 10.71 \ln x \)
Oyster Growth
Tissue DW vs Days

Floating: $r^2 = 0.41$, $p < 0.001$; $y = 23.7 + 98.15 \ln x$
Seapa: $r^2 = 0.46$, $p < 0.001$; $y = 23.7 + 138.64 \ln x$

One Way RM ANOVA
$F_{(1,105)} = 37.792$, $p < 0.001$
*Significant Difference
**Oyster Growth**

**Length vs Tissue DW**

One Way RM ANOVA

\[ F_{(1,109)} = 2.038, \ p = 1.243 \]

*Not Significant*
Conclusions

- **Length growth rates**
  - Not significant

- **Oyster tissue biomass**
  - Significant

- **Length vs oyster tissue biomass**
  - Not Significant

- **Practicality**
  - Lost 9 of 12 Seapa Hybrid Cages during Hurricane Michael
  - Lower mortality in OysterGro cages
  - Higher mortality in Seapa due to increased temps / design.
Objective:
- Determine the effects farms utilizing diploid (2n) oysters have on the wild oyster population.

Measure:
- Oyster recruitment on cement oyster domes.
Mean Low tide

4 Random samples (domes) per treatment monthly

4 25cm² quadrat measures (replicates) per sample

Oyster Cover analyzed using ImageJ
Results

• Predation changed designed

• Depth comparison in oyster percent cover

• One Way RM ANOVA:
  • Arc sin x+1 transformation
  • Significant difference
  • $F_{(2,76)} = 3.36, p=0.36$

• Post-Hoc Tukey:
  • Significant difference in 1’ subtidal treatment (most oyster cover)
**Final Results**

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<thead>
<tr>
<th>After full Fall spawn</th>
<th>Intertidal</th>
<th>1’ Subtidal</th>
<th>3’ Subtidal</th>
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Within two months

- Significant coverage *inside*
- Significant coverage *outside as well on domes*
- Spring spawn

300-500 mature Oysters
High success rate of retention due to confined protected space.
Future Work

- So why is this important?
- Formulation of Advisory Council
  - Scientific Experts, Past Students, Legislators, Business Leaders, Stakeholders, etc.
  - Identify Challenges, mitigating factors
- Oyster Aquaculture: Environmental, Economic, and Legislative challenges.
- In Wakulla County, Oyster Aquaculture is third largest Employer
- After two years, 6-8 Million Oysters in Bay. From Barren Desert to teaming with life CLEAN WATER.
Future Work

- How can we export clean water – deployable?
- RESTORD-Tech (Restoring Seed Through Oyster Reef Dome Technology).
- Sarasota - $44,000,000.00 impact from RED TIDE
- Florida has the second largest coastline /Tourism
- Thousands of years Oyster Reefs were along Eastern Seaboard/ Nature took its course.
- Answers two questions:
  - One of the answers to re-seeding Apalachicola Bay
  - Will effectively combat Red Tide and other HAB’s
Acknowledgements

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FAMU Graduate/Under Grad Students

Dr. Charles Jagoe (FAMU)
Aquaculture Research

• **Worldwide Decline of Oyster Populations**
  o >1% of historical levels (FAO, 2014)
  o Need for increased oyster production

• **Increased demand of oyster production (consumption)**
  o Additional benefit is increased water quality
    ▪ Cleaner water
    ▪ Improved aquatic habitat

• **Filter Feeding**
  o Remove organic matter
    ▪ Causes low dissolved oxygen levels
    ▪ Lower nutrient loading from terrestrial runoff
Aquaculture Research

- **Waste Water Treatment is Limited**
  - Effective for land-based water
  - Limited to coastal pollution/runoff
    - While there is an increase in coastal pollution/excessive nutrient removal

- **Studies show filter feeding shellfish can remove nutrients**
  - Providing an ecosystem service of water quality improvement
    - (Beseres-Pollack et al., 2013; Bricker et al., 2014, 2015a, 2015b; Ferreira et al., 2007; Filgueira et al., 2014a, 2014b; Lindahl et al., 2005).
Aquaculture Research

- Eutrophication (excessive nutrients)
  - Excessive algal blooms
    - Harmful algal blooms (HABs)
  - Lower Dissolved Oxygen
    - Hypoxic/Anoxic Waters
  - Loss of Seagrass
    - Decreasing habitat
      - Nurseries
      - Less Oxygen