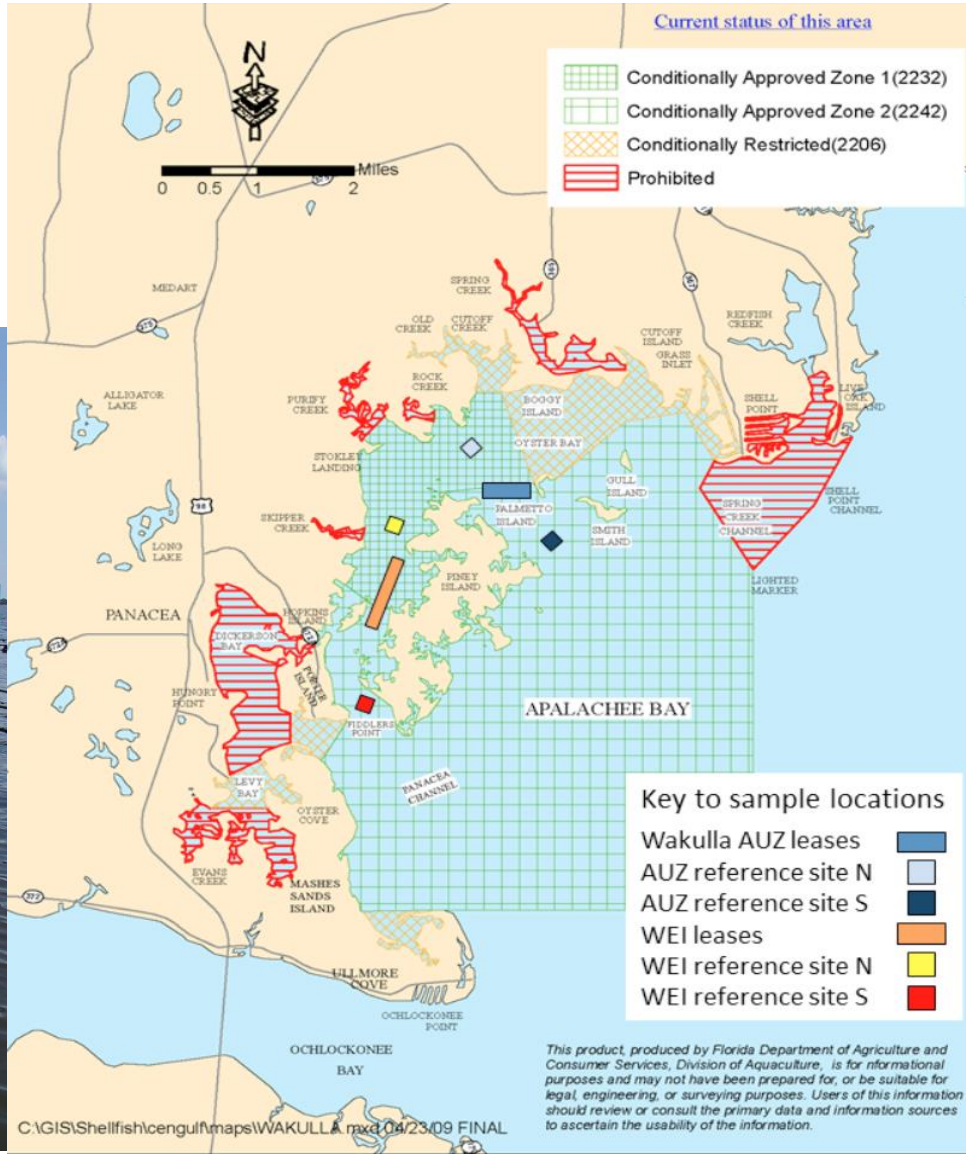
Experimentation of Different Oyster Growing Methods and Spat Retention in Oyster Bay, Florida

A. Wynn[a], B. Ballard[a], M. Marquez[b], C. Jagoe[b]

[a]Wakulla Environmental Institute, Tallahassee Community College, Crawfordville, FL
[b]School of the Environment, Florida A&M University, Tallahassee, FL

Research Site

Oyster Bay, Florida
WEI 5.5-acre aquaculture research site



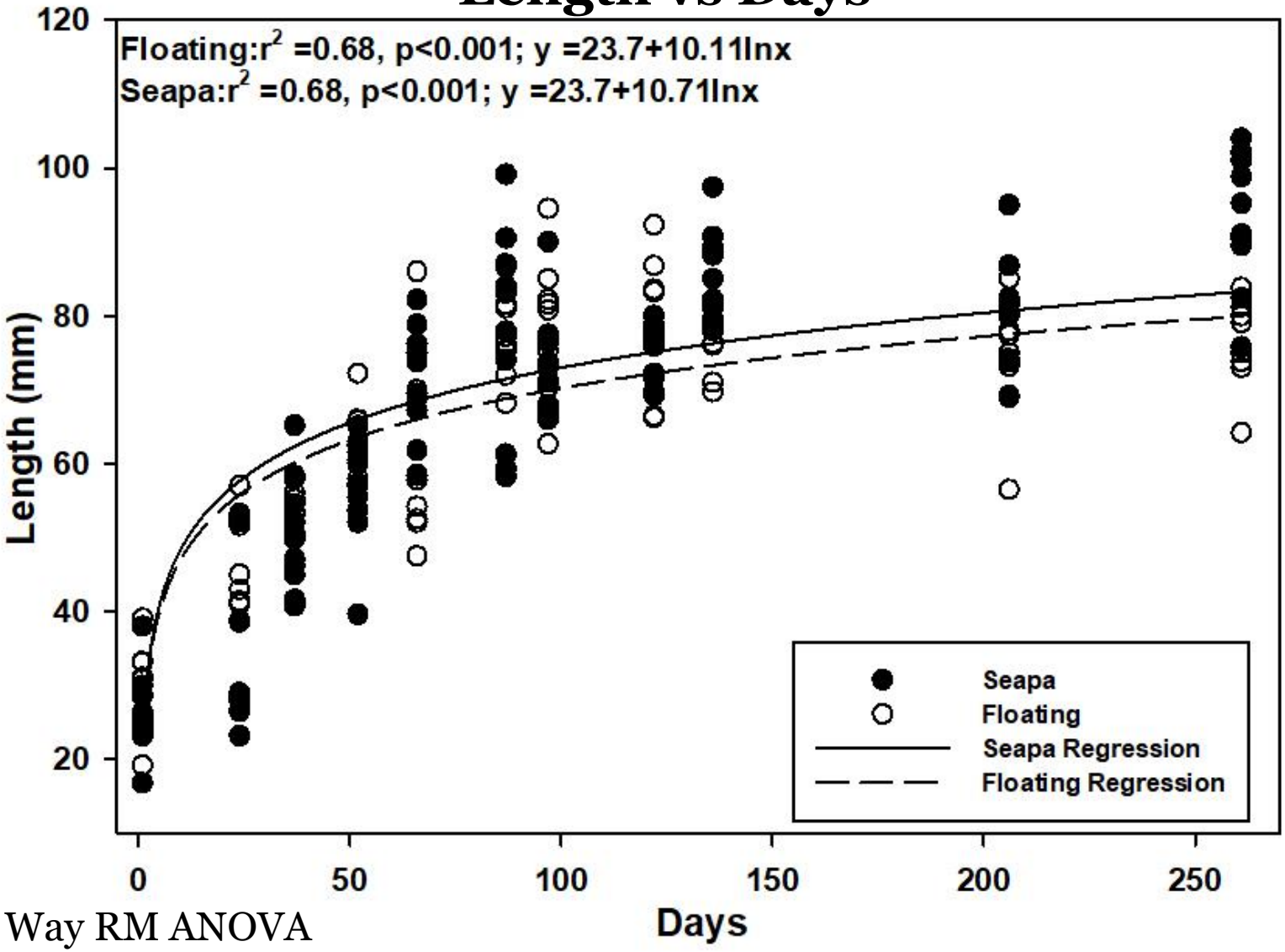
Oyster Growing Methods

- 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



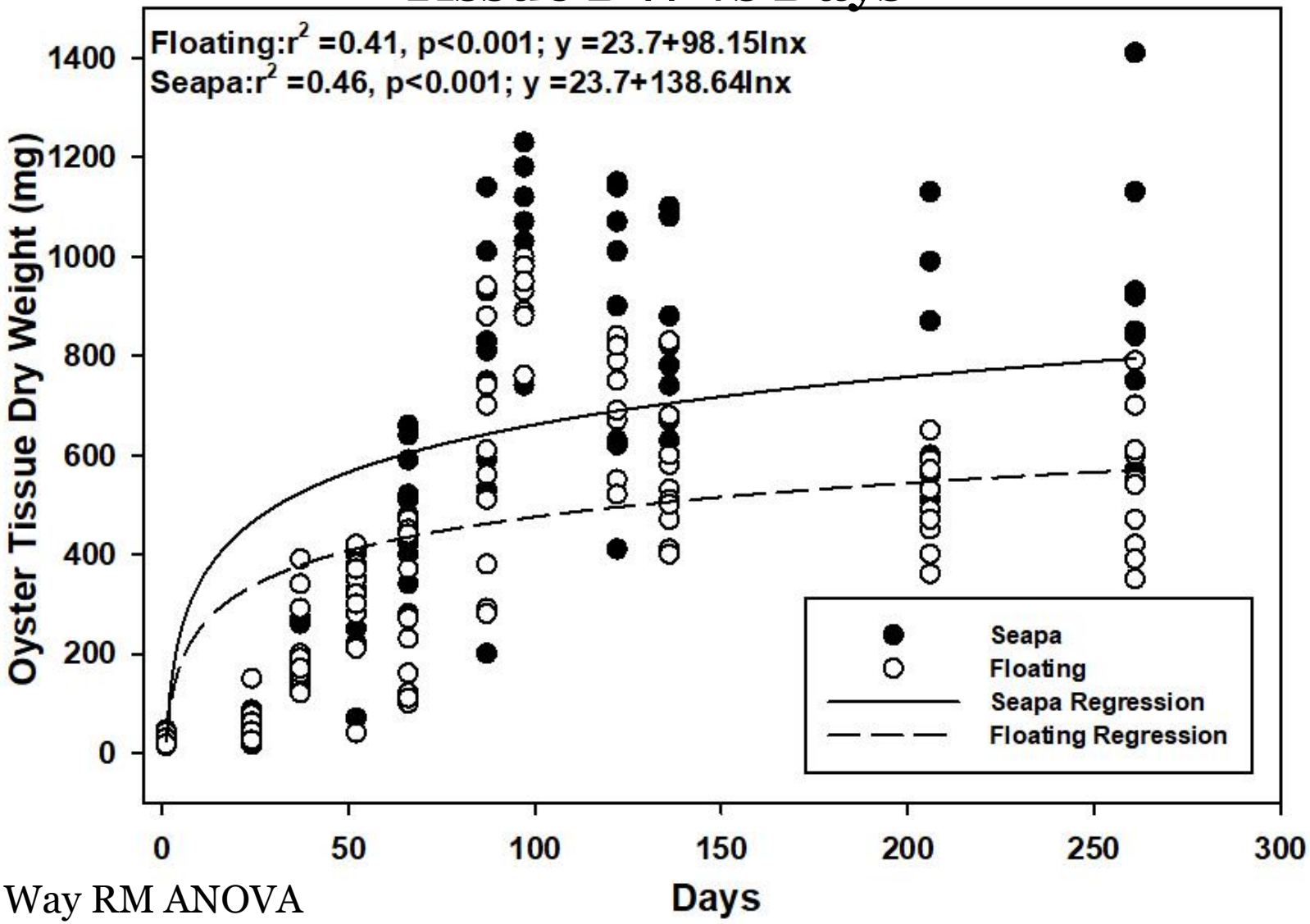
One Way RM ANOVA

$F_{(1,109)}$=2.038, p=0.156

*Not Significant

Oyster Growth

Tissue DW vs Days



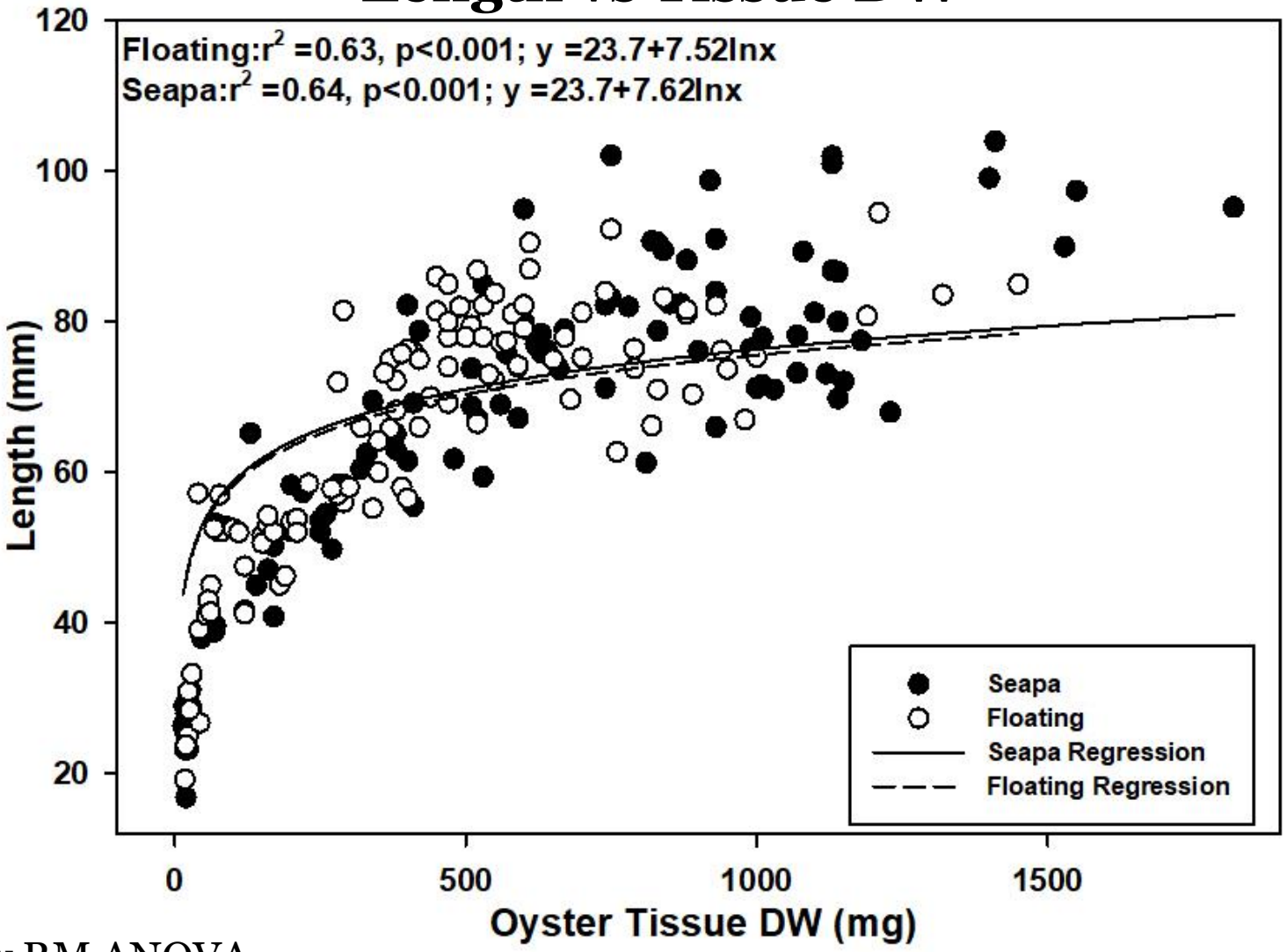
One Way RM ANOVA

$F_{(1,105)}$=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.

Oyster Domes

- Objective:
  - Determine the effects farms utilizing diploid (2n) oysters have on the wild oyster population.

- Measure:
  - Oyster recruitment on cement oyster domes.

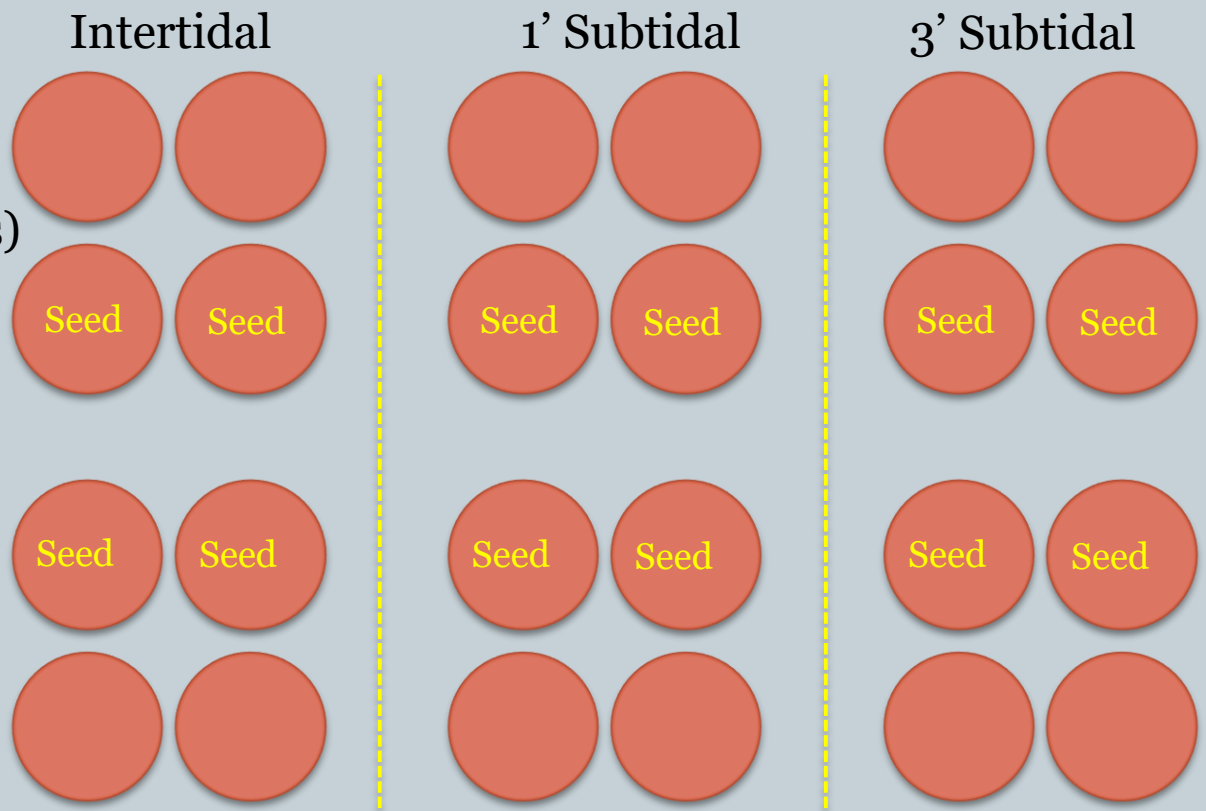
Design

Mean Low tide

4 Random samples (domes) per treatment monthly

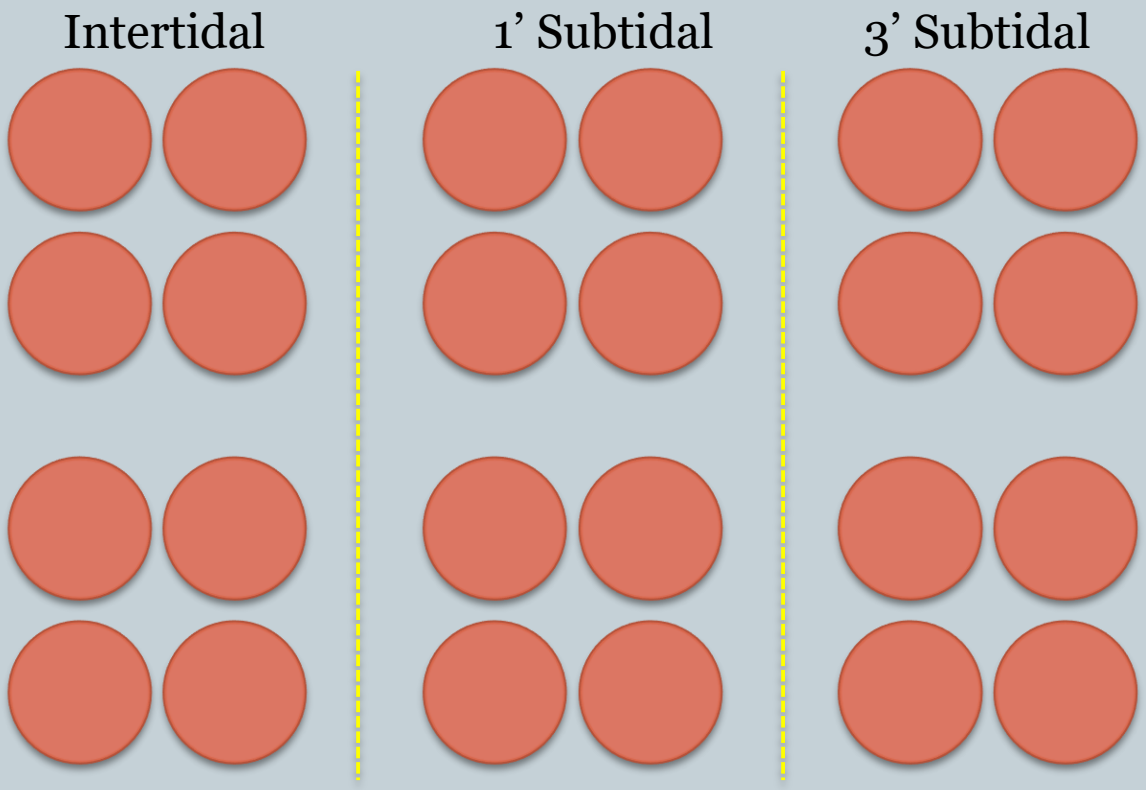
4 25cm² quadrat measures (replicates) per sample

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

After full Fall spawn

Within two months

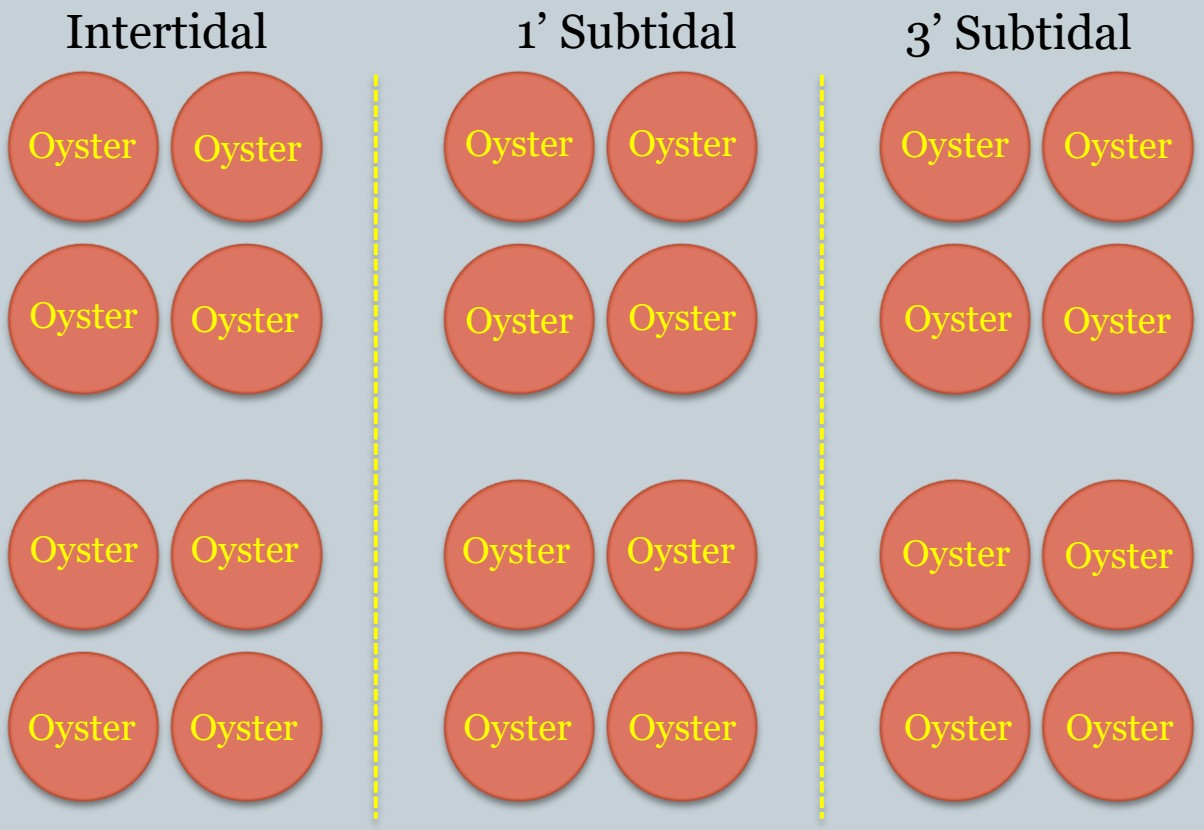
Significant coverage *inside*

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

GSMFC - Funding

WEI Aquaculture Students and Staff

FAMU Graduate/Under Grad Students

Dr. Charles Jagoe (FAMU)

Aquaculture Research

- Worldwide Decline of Oyster Populations
  - >1% of historical levels (FAO, 2014)
  - Need for increased oyster production
- Increased demand of oyster production (consumption)
  - Additional benefit is increased water quality
    - Cleaner water
    - Improved aquatic habitat
- Filter Feeding
  - 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