



# “Tankless” Oyster Setting:

## A new tool for seeding oyster reefs in the Chesapeake

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Funded By:



# Chesapeake Oyster Status

## Population:

- One percent of historic levels
- Broodstock limited
- Low natural recruitment in most areas
- Substrate limited



# Chesapeake Oyster Status

## Current Restoration Standard:

Hatchery- produced spat-on-shell to seed reefs

Works, but has limitations:

- Tank-space limited;
- Materials-handling intensive;
- No economy of scale;
- Shell intensive in a shell-limited environment



# Tankless Oyster Setting

## Concept:

Set larvae directly onto a reef.

- Surround a small-scale reef with a temporary boom;
- Release larvae into the boom;
- Compare set to controls and typical tank set rates



# Tankless Oyster Setting

## Project Design:

### Reef:

- New shell reef constructed for this experiment
- Approx 3 meters across and .3 meters high
- Scale of experiment approximates the size of a setting tank
- Set larvae as we would in a tank



# Tankless Oyster Setting

## Project Design:

### Boom:

- Based on a commercial 'curtain boom'
- Closed-cell foam floats
- Reinforced plastic curtain
- Weighted bottom
- One water-exchange portal covered with fine mesh



## Project Design:

### Location:

- MLW 1 meter; tidal difference .5 meters
- Protected: little wave energy; no vessel traffic
- Mesohaline: salinity ranged from ~10.2-12.4
- No natural oyster reefs or spat set in this creek



- Solar bubbler utilized

## Experimental Design:

- Mesh bags of shell placed onto the reef
- Control A: mesh bags of shell upstream and downstream of boom
- Control B: mesh bags of shell placed in shore side mesocosm (mesocosm was set with larvae from the same batch)
- Continuous water quality monitors in inside boom and shoreside mesocosm
- 3-day setting period for larvae
- Three replicates
- 21-day grow-out time
- Compare sets between tank and controls





# Results

## Metric for comparison:

Average number of spat-on shell among treatments

## Statistical analysis:

- Kruskal-Wallis (non-parametric test in lieu of a 1-way ANOVA)

- Post-hoc multi-comparison tests for significance



| Trial   | Inside the Boom | Shoreside Mesocosm | Upstrm Control | Downstm Control | p-value | Significant differences |
|---------|-----------------|--------------------|----------------|-----------------|---------|-------------------------|
| 1       | 4.9             | 12.9               | 0              | 0               | <0.001  | M>B> UC =DC             |
| 2       | 5.7             | 6.3                | 0              | 0               | <0.001  | M=B> UC=DC              |
| 3       | 5.2             | 4.4                | 0              | 0               | <0.001  | M=B> UC=DC              |
| Pool ed | 5.3             | 7.9                | 0              | 0               | <0.001  | M=B> UC=DC              |

Data pooled over trials showed that  
**sets in the boom** (*"tankless set"*)  
**and sets in the mesocosm** (*traditional tank set*)  
were NOT statistically different.

**Results:**

**Comparison to  
traditional tank-  
produced  
spat-on-shell:**

|            | Traditional Tank<br>Set Rates<br>(spat per shell) | "Tankless" Set<br>Rates<br>(spat per shell) |
|------------|---|---|
|            | 10.6  | 4.9   |
|            | 5.6   | 5.7   |
|            | 4.2   | 5.2   |
|            | 10.2  |   |
| <b>Ave</b> | <b>7.65</b>                                       | <b>5.3</b>                                  |

## Next Steps/ Discussion:



- Scale up (1-2 acres)
  - Crane for boom deployment
  - Possible 'mother ship' anchored outside boom for 3-day setting period (oxygenate; tend boom)
- Utilize this technique on an alternative-substrate reef, creating a completely "shell-less" reef
- On-bottom aquaculture applications?
- Refine technique/ Compare cost and efficiency (cost; set rates; shell limitations; materials handling; scalability) to traditional tank setting
- May not work well in low-salinity waters; one possible scenario:
  - Oligohaline = hatchery-produced spat-on-shell;
  - Mesohaline = Tankless setting
  - Polyahline w/ low natural spat set= Tankless setting
  - Polyhaline w/ high natural spat set = "Build it and they will come"













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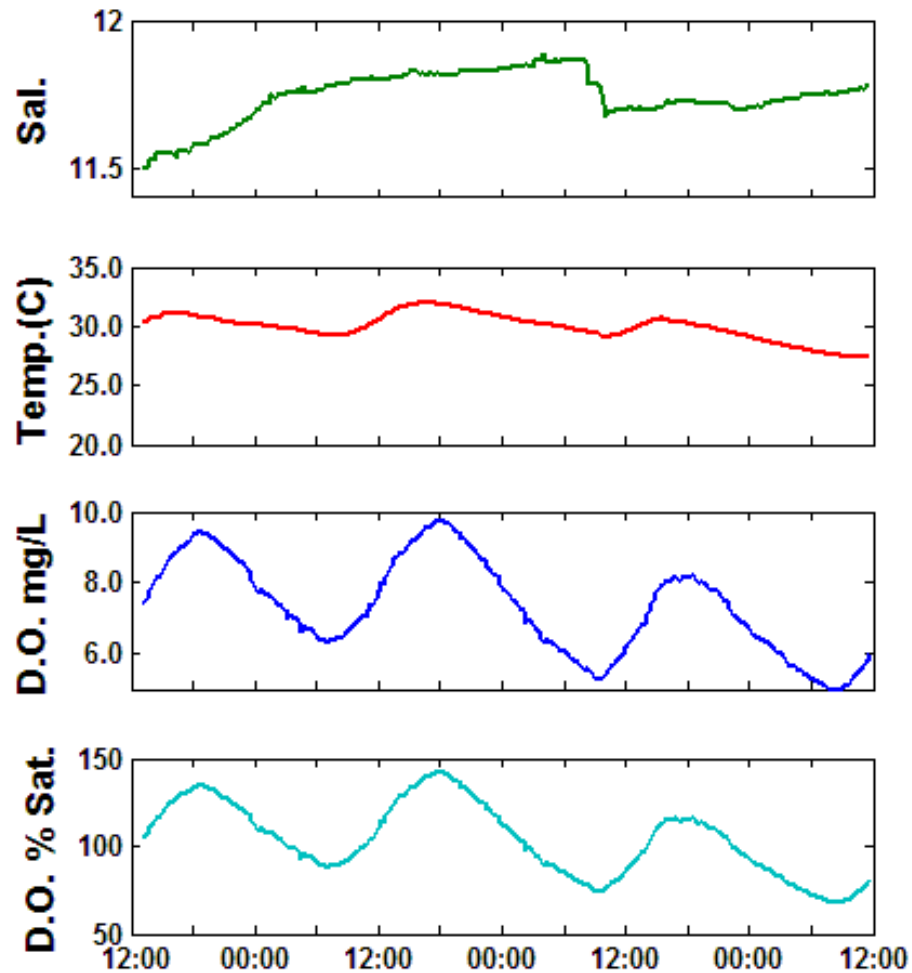
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*Special thanks to Dr. Jay Leverone*

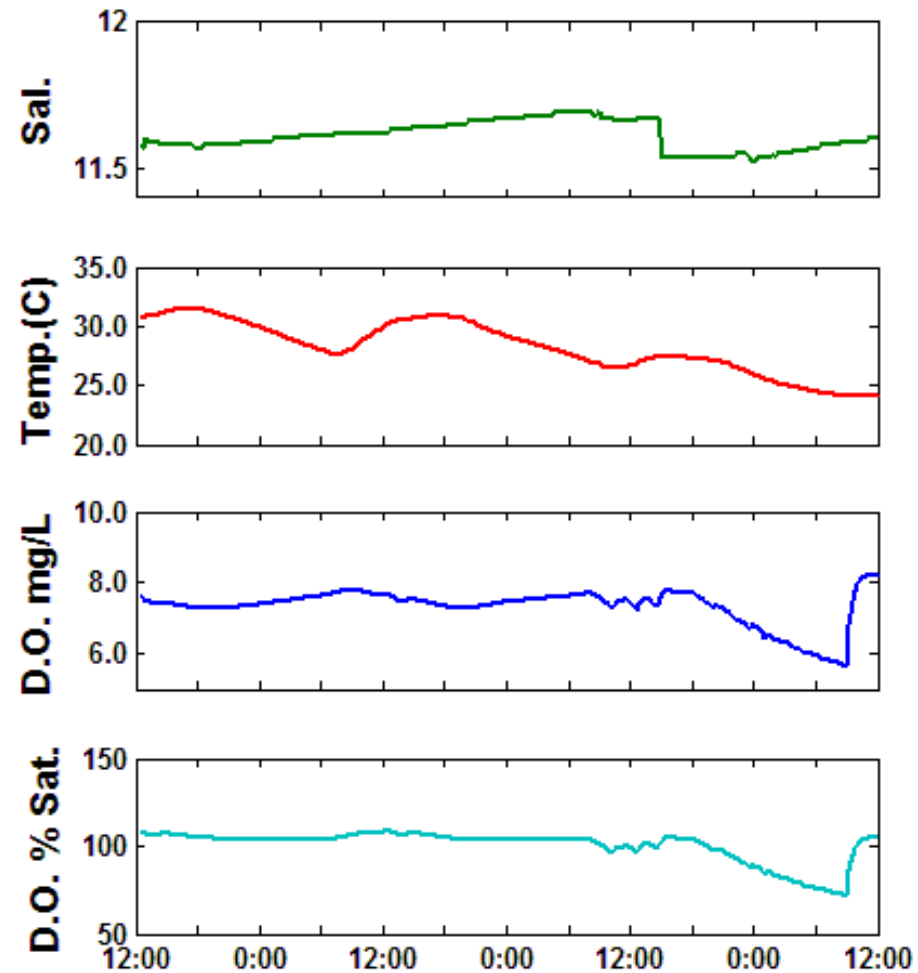


# Results- Physical Parameters Trial #1

## Boom



## Meso



| <b>Trial</b>   | <b>Inside the Boom</b> | <b>Shoreside Mesocsm</b> | <b>Upstrm Control</b> | <b>Downstm Control</b> | <b>p-value</b>   | <b>Significant differences</b> |
|----------------|------------------------|--------------------------|-----------------------|------------------------|------------------|--------------------------------|
| <b>1</b>       | <b>4.9</b>             | <b>12.9</b>              | <b>0</b>              | <b>0</b>               | <b>&lt;0.001</b> | <b>M&gt;B&gt; UC =DC</b>       |
| <b>2</b>       | <b>5.7</b>             | <b>6.3</b>               | <b>0</b>              | <b>0</b>               | <b>&lt;0.001</b> | <b>M=B&gt; UC=DC</b>           |
| <b>3</b>       | <b>5.2</b>             | <b>4.4</b>               | <b>0</b>              | <b>0</b>               | <b>&lt;0.001</b> | <b>M=B&gt; UC=DC</b>           |
| <b>Pool ed</b> | <b>5.3</b>             | <b>7.9</b>               | <b>0</b>              | <b>0</b>               | <b>&lt;0.001</b> | <b>M=B&gt; UC=DC</b>           |