

# Effects of Tidal Resuspension with Oyster Biodeposits and Filtration in a Simulated Chesapeake Bay Ecosystem

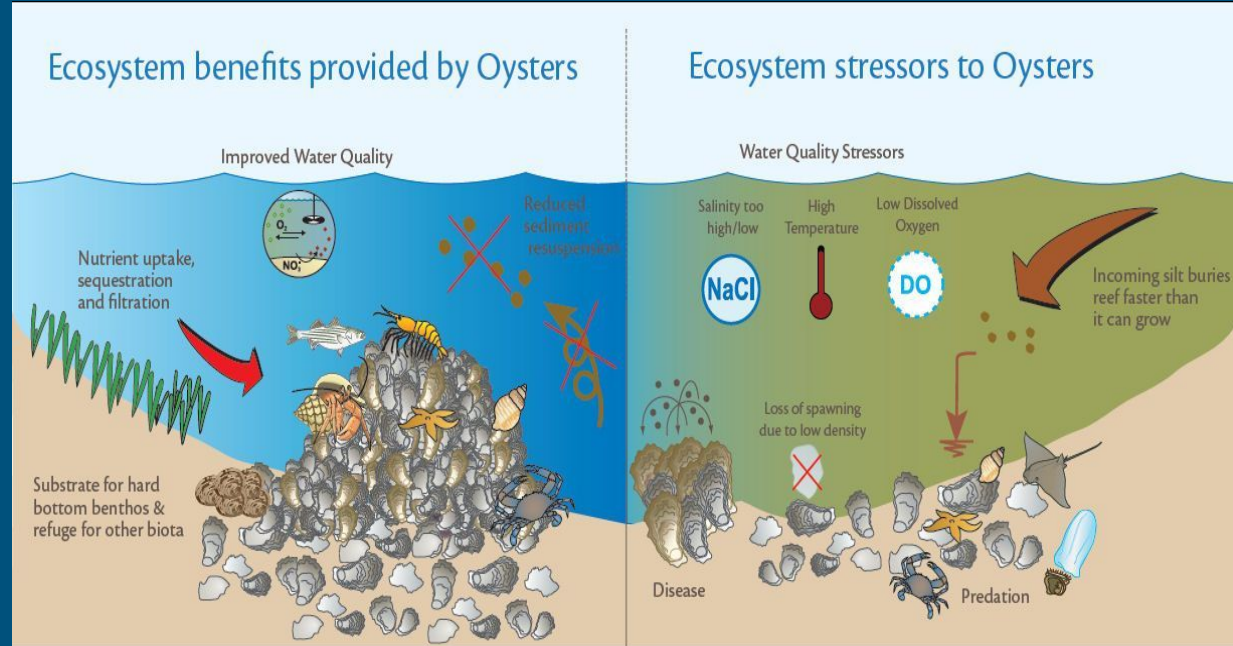
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# Background

- Oysters
  - Suspension feeders
  - Filter water
  - Produce biodeposits
- Seston
  - PIM
  - POM
  - Sediment
- Experiment
  - Filtration



# Hypotheses

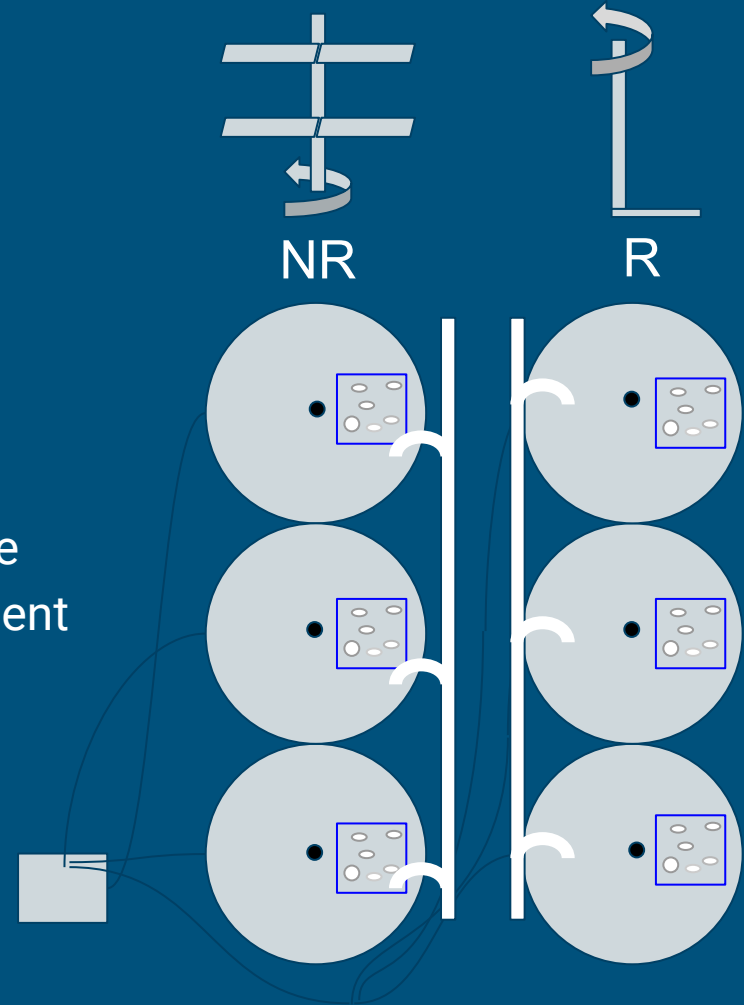
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- Resuspension tanks
  - Higher seston concentration
  - Lower DO levels
- Oysters will cause lower:
  - Seston concentration
  - DO levels
  - In-vivo Fluorescence



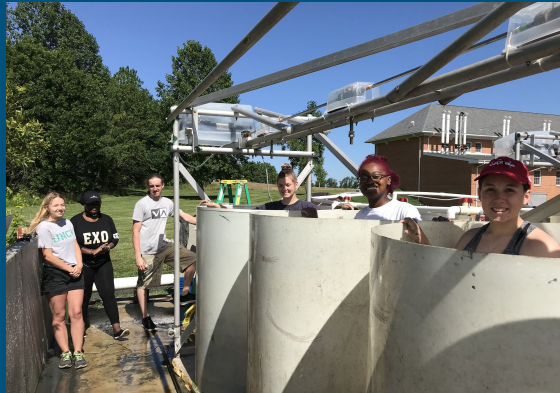
# Methods

- Last year
  - 6 tanks, 3 resuspension (R), 3 non-resuspension (NR), addition of biodeposits, non-resuspension have lower shear stress, 4 week experiment
- This year
  - Addition of oysters



# Study Site

- Collected mud from the Patuxent River, near the mouth of the St. Leonard Creek
- Mud placed in mesocosm tanks at PEARL with a 2-week equilibration period (Porter et al. 2006)



# Methods

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## Daily Measurements

- Dissolved Oxygen
- In-vivo Fluorescence
- Secchi depth (on/off phases)
- Temperature (every 10 minutes)
- Turbidity

## Other sampling

- Denitrification ( $N_2$  flux)
- Biogeochemical Nutrient and Gas Fluxes
- Particulate Sediments
- Light
- Phytoplankton

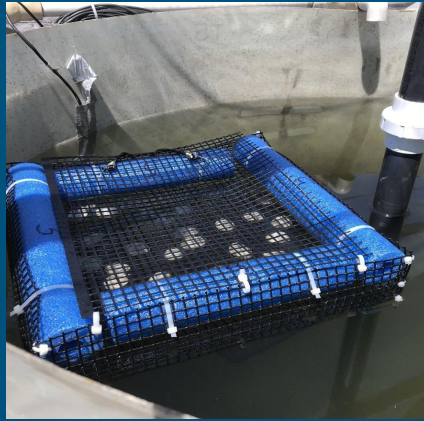
## Biweekly Measurements

- TSS (Twice a week)
  - Particulate Inorganic Matter (PIM) and Particulate Organic Matter (POM)
- Zooplankton
- Nutrients
  - Ammonium
  - Phosphate
  - Nitrate+nitrite
  - Etc.



# Experiment

- Added oysters
- Filters
  - Collected samples
  - Filtered
  - Dried at 60°C
  - Weighed
  - Dried at 450°C
  - Weighed



# Data Analysis

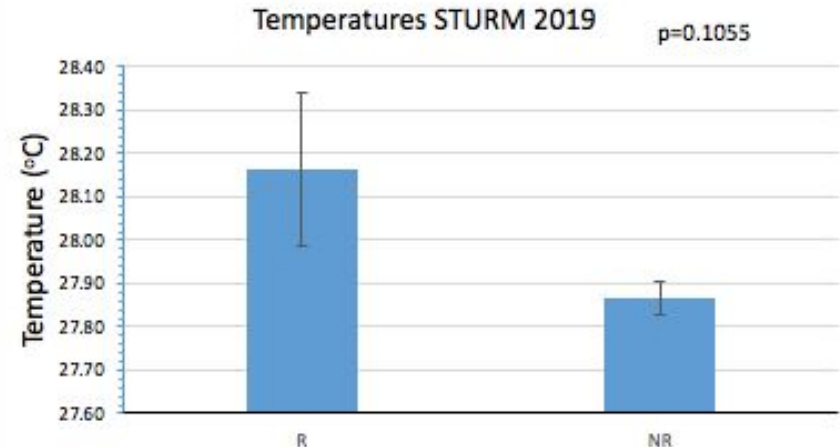
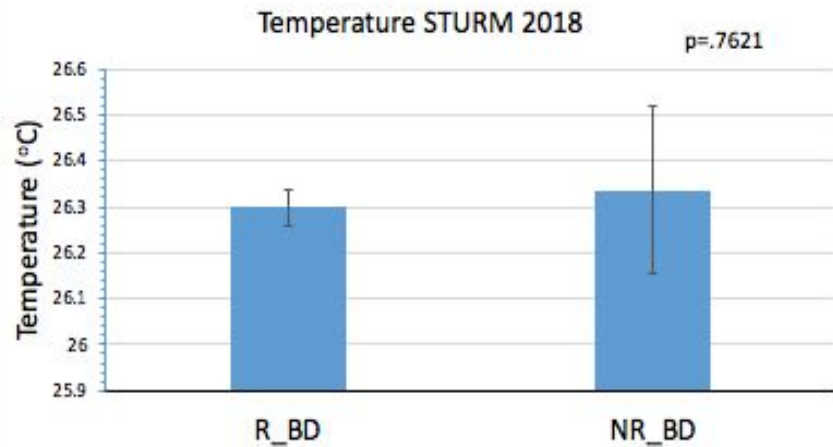
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- Used t-tests in Excel to compare:
  - Seston concentration
  - DO
  - Temperature
  - In-vivo fluorescence
- Will compare:
  - Nutrient levels
    - Chlorophyll a
    - Ammonium
    - Nitrate+nitrite





# Temperatures



# Seston

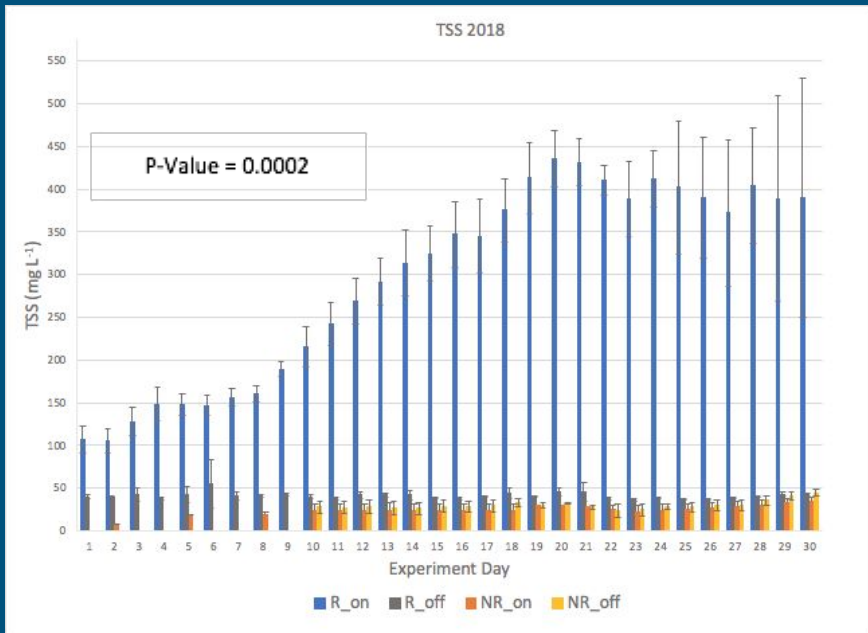
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Predictions:

Lower in 2019 vs. 2018

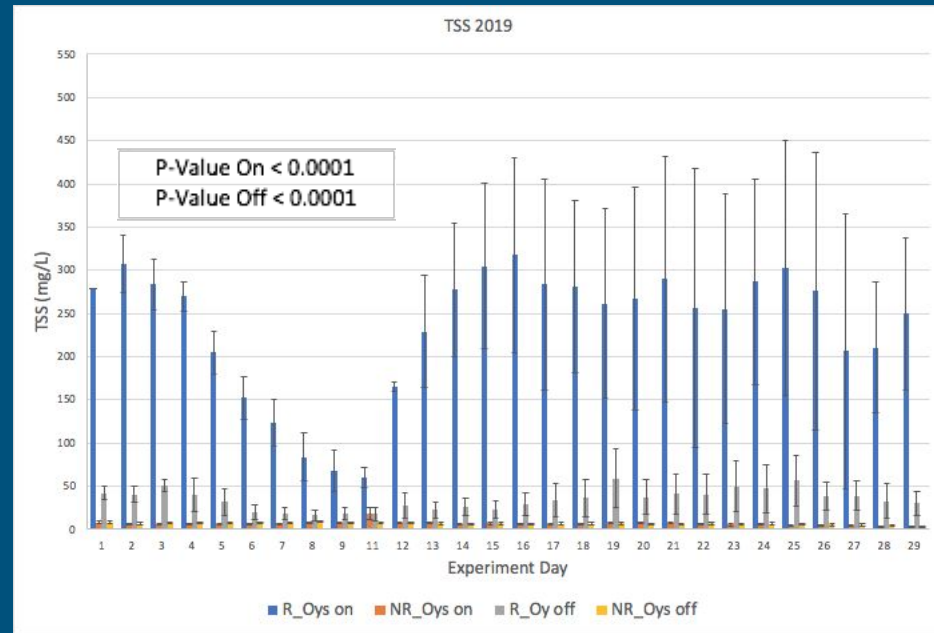
Lower in NR tanks

# Seston



T-test for 2018 R vs. 2019 R

- P-value = 0.0503



T-test for 2018 NR vs. 2019 NR

- P-value < 0.0001

# Dissolved Oxygen

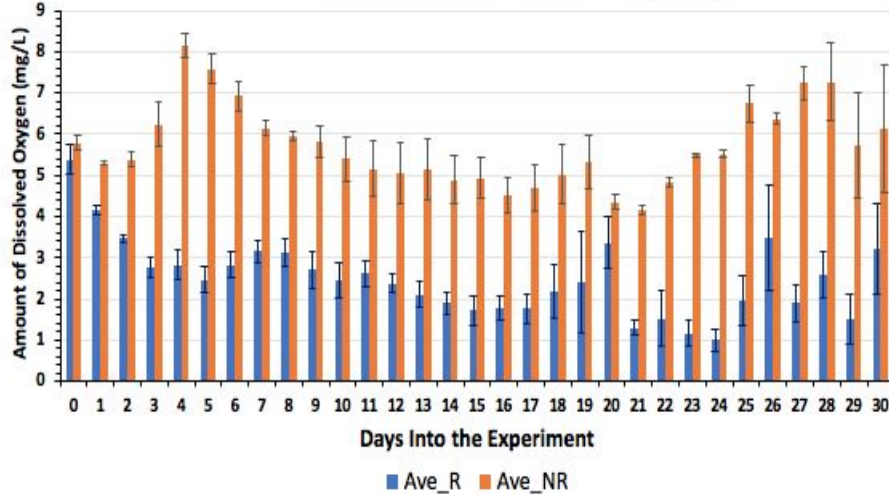
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Prediction:  
Lower levels in 2019 vs. 2018

# Dissolved Oxygen

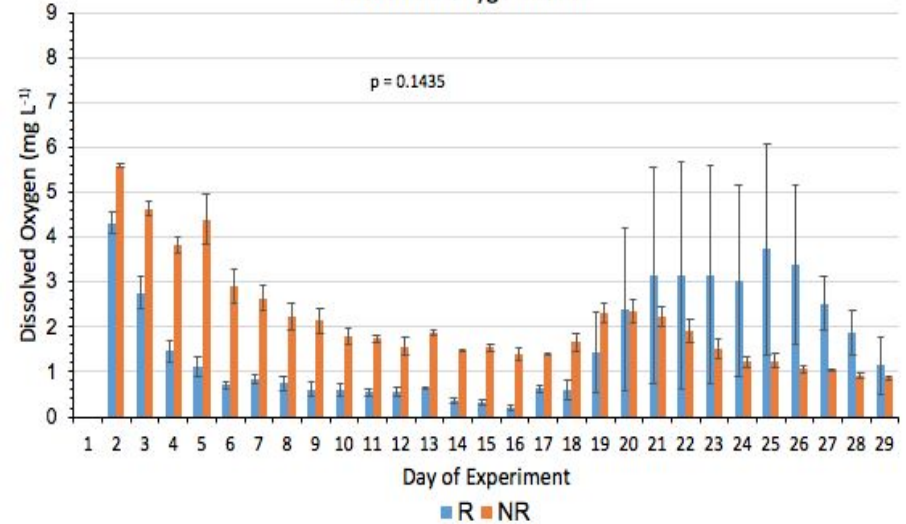
Dissolved Oxygen 2018

$p < 0.0001$



Dissolved Oxygen 2019

$p = 0.1435$



T-test for 2018 R vs. 2019 R

- P-value = 0.005

T-test for 2018 NR vs. 2019 NR

- P-value < 0.0001

# In-vivo Fluorescence

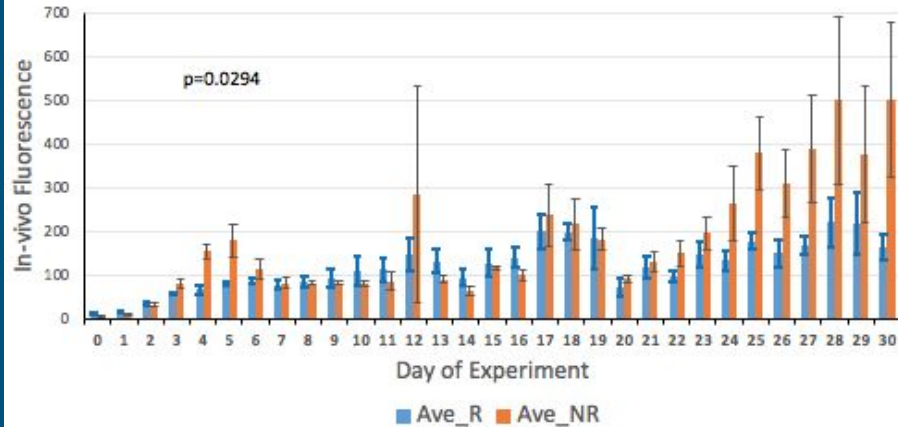
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Prediction:

Lower levels in 2019 vs. 2018

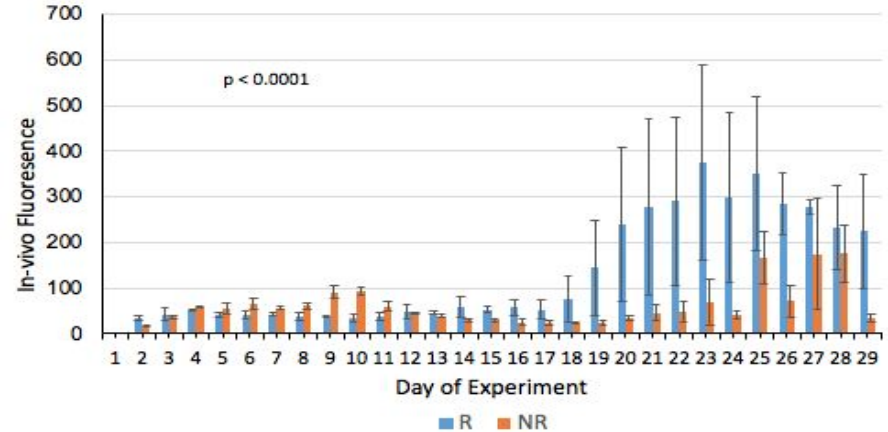
# In-vivo Fluorescence

In-vivo Fluorescence 2018



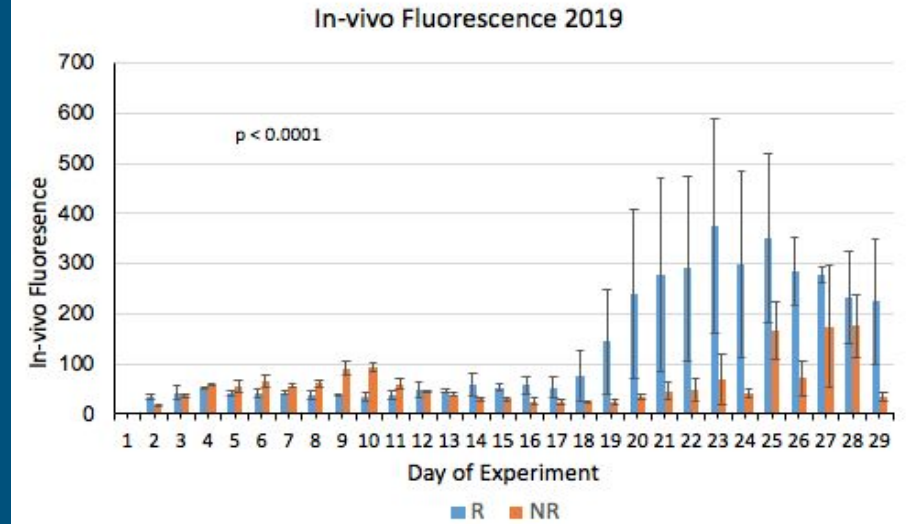
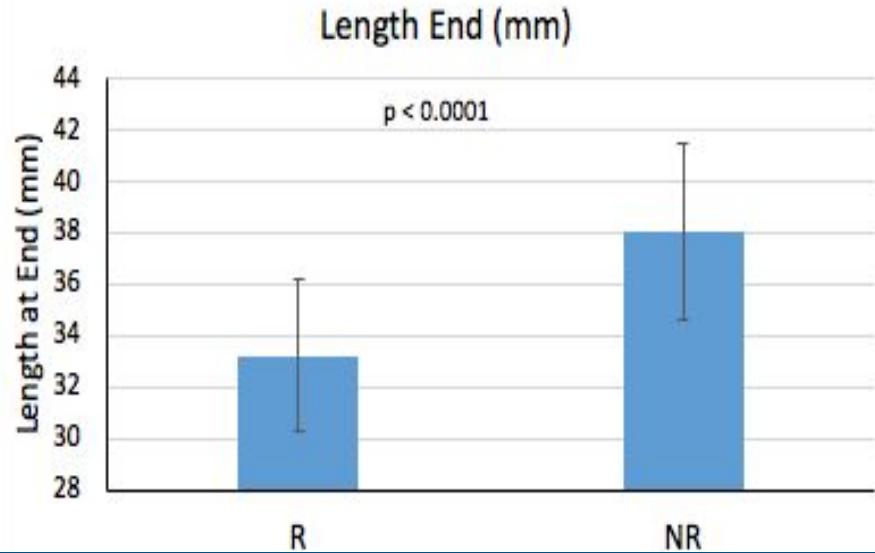
T-test for 2018 R vs. 2019 R  
● P-value = 0.5618

In-vivo Fluorescence 2019



T-test for 2018 NR vs. 2019 NR  
● P-value  $< 0.0001$

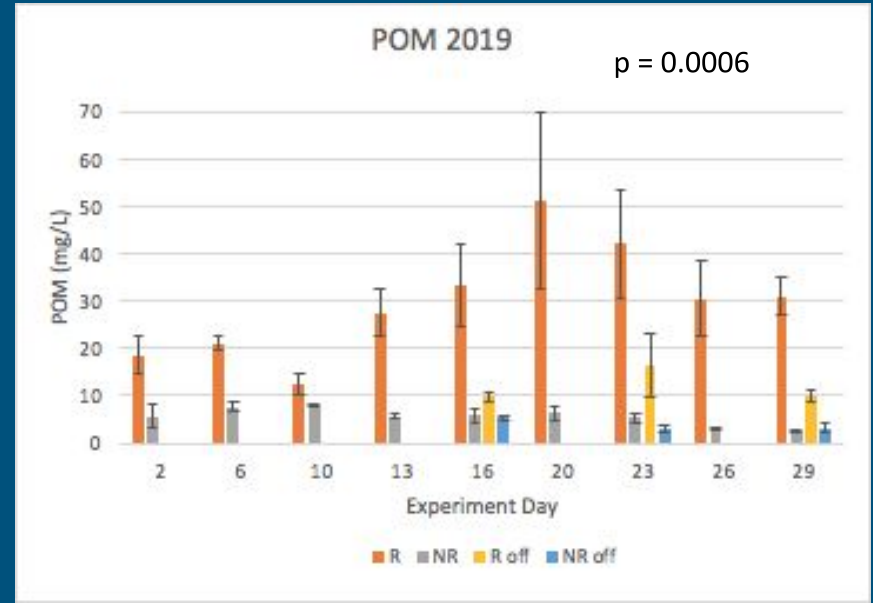
# Oyster Growth





# Particulate Organic Matter (POM)

- Significant difference between R and NR
- Variability due to differences between tanks 1, 2, and 3



# Future Analysis

- Water Column
  - Chlorophyll a
  - Nitrate+nitrite
  - Ammonium
  - SRP (Phosphate)
  - Silicate
  - Particulate N, C, and P
  - Phytoplankton/Zooplankton
  - Light
- Biogeochemical Fluxes
  - $N_2$
  - $O_2$
  - Nitrate+nitrite
  - Ammonium
  - SRP (Phosphate)
  - Sediment Chlorophyll a



# 2019 Conclusions

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- Significant difference between 2019 R and NR
  - Seston
  - In-vivo Fluorescence
- Non-significant difference between 2019 R and NR
  - Dissolved Oxygen

# 2018 vs. 2019

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- Significant difference between 2018 R and 2019 R
  - Dissolved Oxygen
- Significant difference between 2018 NR and 2019 NR
  - Seston
  - Dissolved Oxygen
  - In-vivo Fluorescence

# Acknowledgements

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# Thanks for a great summer!

