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

- **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

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

Other sampling
- Denitrification (N₂ 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

- Used t-tests in Excel to compare:
  - Seston concentration
  - DO
  - Temperature
  - In-vivo fluorescence

- Will compare:
  - Nutrient levels
    - Chlorophyll a
    - Ammonium
    - Nitrate+nitrite
Temperatures

- Temperature STURM 2018
  - p = 0.7621

- Temperature STURM 2019
  - p = 0.1055
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

Prediction:
Lower levels in 2019 vs. 2018
Dissolved Oxygen

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

Prediction:
Lower levels in 2019 vs. 2018
In-vivo Fluorescence

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

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

![Length End (mm) Chart]

- Length at End (mm)
- p < 0.0001

![In-vivo Fluorescence 2019 Chart]

- In-vivo Fluorescence
- Day of Experiment
- R and NR
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

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

- Non-significant difference between 2019 R and NR
  - Dissolved Oxygen
2018 vs. 2019

- Significant difference between 2018 R and 2019 R
  - Dissolved Oxygen

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