Effects of Sediment Organic Matter Content on the Dissolution of Oysters in Apalachicola Bay

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Why are sediment characteristics important to study?

- Florida has suspended Apalachicola Bay wild oyster harvesting until 2025, due to the collapse of oyster populations. Oyster shell dissolution has been a topic of discussion.
- This study aimed to experimentally determine potential rates of shell dissolution occurring as a function of sediment types in the region with variable organic matter (OM) content and apply those rates to in-situ oyster shell

Results

- Shells in the mangrove sediment experienced the highest dissolution, followed by the subtidal, leaf litter, then intertidal. The most corrosive substrates also had the highest organic matter concentrations (Figures 4 and 5). This indicates that sediments with higher organic matter dissolve oyster shells at higher rates.
- Using preliminary data by Engelbert et al. 2023 (Figure 1), we can extrapolate potential dissolution rates of in-situ oyster shell found in the Bay (Figure 6)

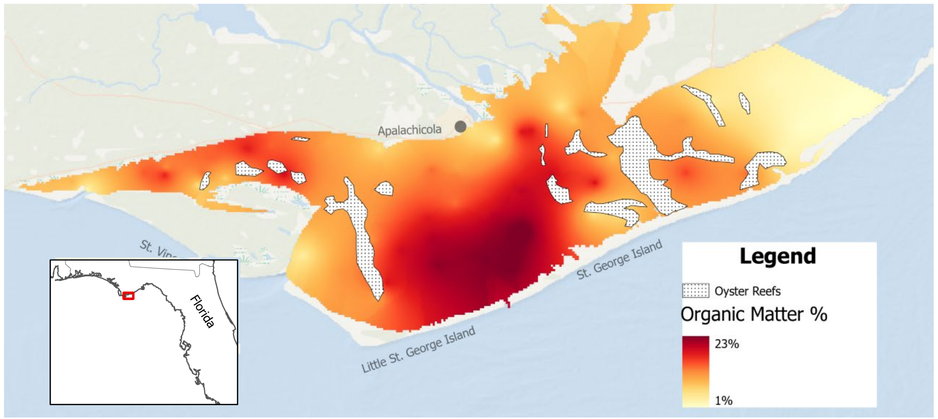

Figure 1: OM% found in Apalachicola Bay based on preliminary data by Engelbert et al. 2023. Mean OM% is 10% and a maximum value of 23%

Methodology

- **We calculated the % mass loss of shells in mesocosms with substrates of varying organic matter content over two years (Figure 5).**
  - We used four different sediment types which included: intertidal oyster reef, intertidal oyster reef with leaf litter on top, mangrove, and subtidal
- **Loss-on-Ignition and elemental analysis were used to calculate organic matter % (Fig. 2)**
- **We used experimental mesocosm data and preliminary data of Apalachicola Bay sediment OM% by Engelbert et. al., 2023 to predict the dissolution of oysters currently living in the Bay**

Figure 2: Sediments being prepped for Loss-on-ignition (Organic Matter Content)(left) and the mesocosms (right)

Figure 3: Oyster shells used for the mesocosm experiment when washed from the sediment

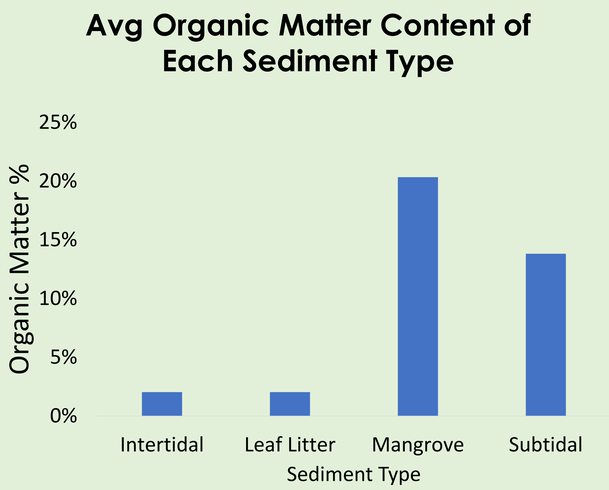

Figure 4: Organic Matter % of each sediment substrate type the shells were in

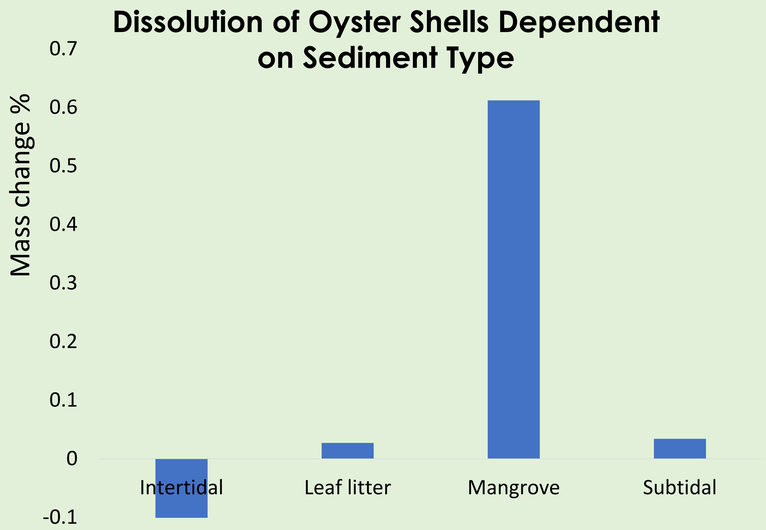

Figure 5: The difference in mean weight % of the shells. X-axis is the substrate type; Y-axis values are the mean weight change % of oyster shell in that substrate Negative values could be due to error in measuring or cleaning of shells.

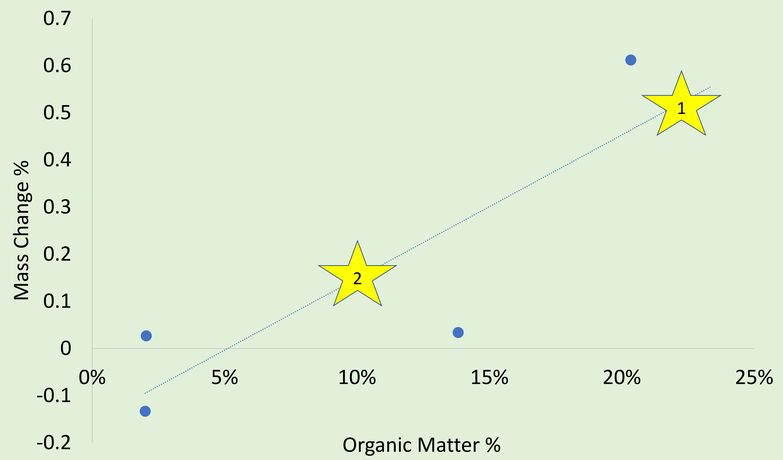

Figure 6: Values from each substrate OM% vs. mean wt. % change, and potential dissolution of in-situ oyster shell based on OM%. Star 1 indicates the highest OM% in the bay (23%) and Star 2 indicates mean OM% (10%) based on preliminary data by Engelbert et al. 2023 in Figure 1.