Sediment Organic Matter as a Primary Indicator of Summer Mortality

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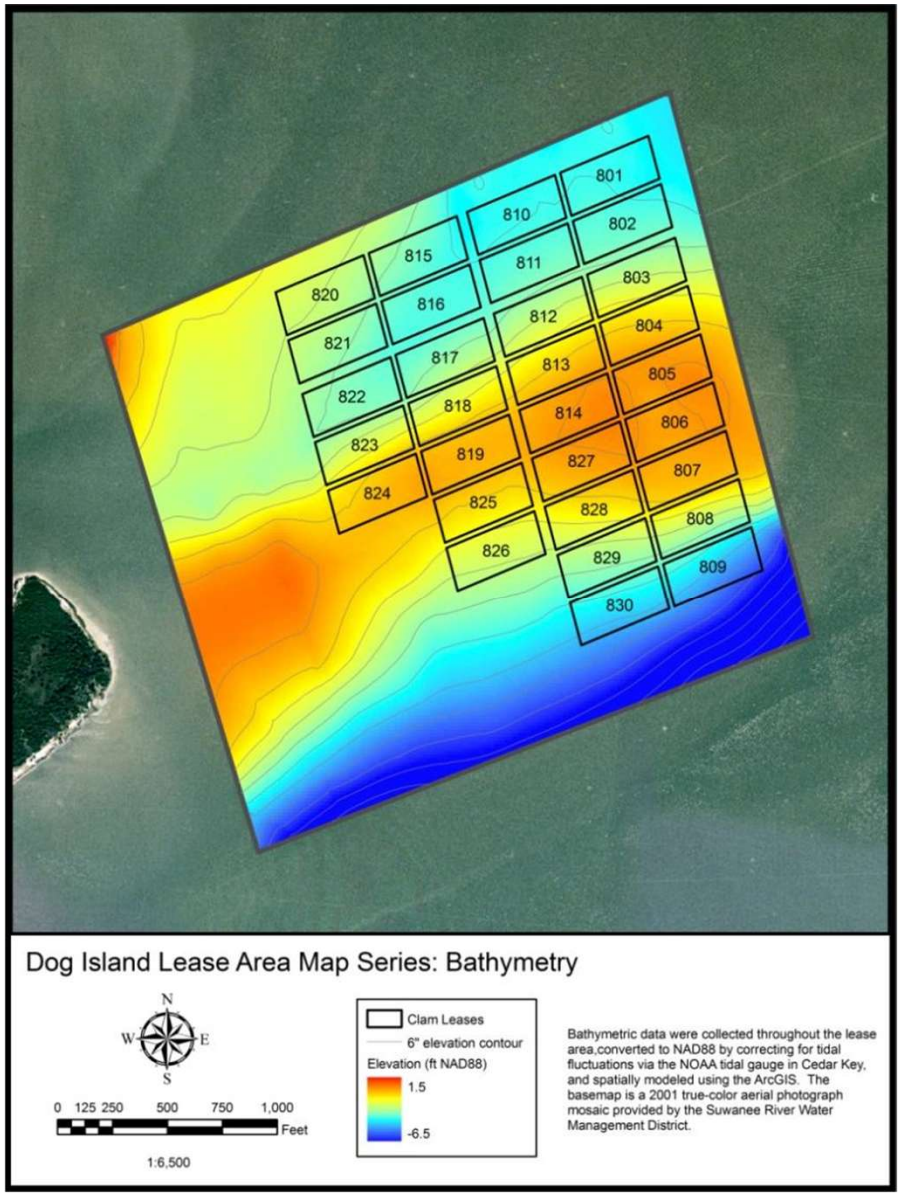
Florida

PREVIOUS WORK

- Spatial inventory of Dog Island soil and bathymetry
- 2007-8



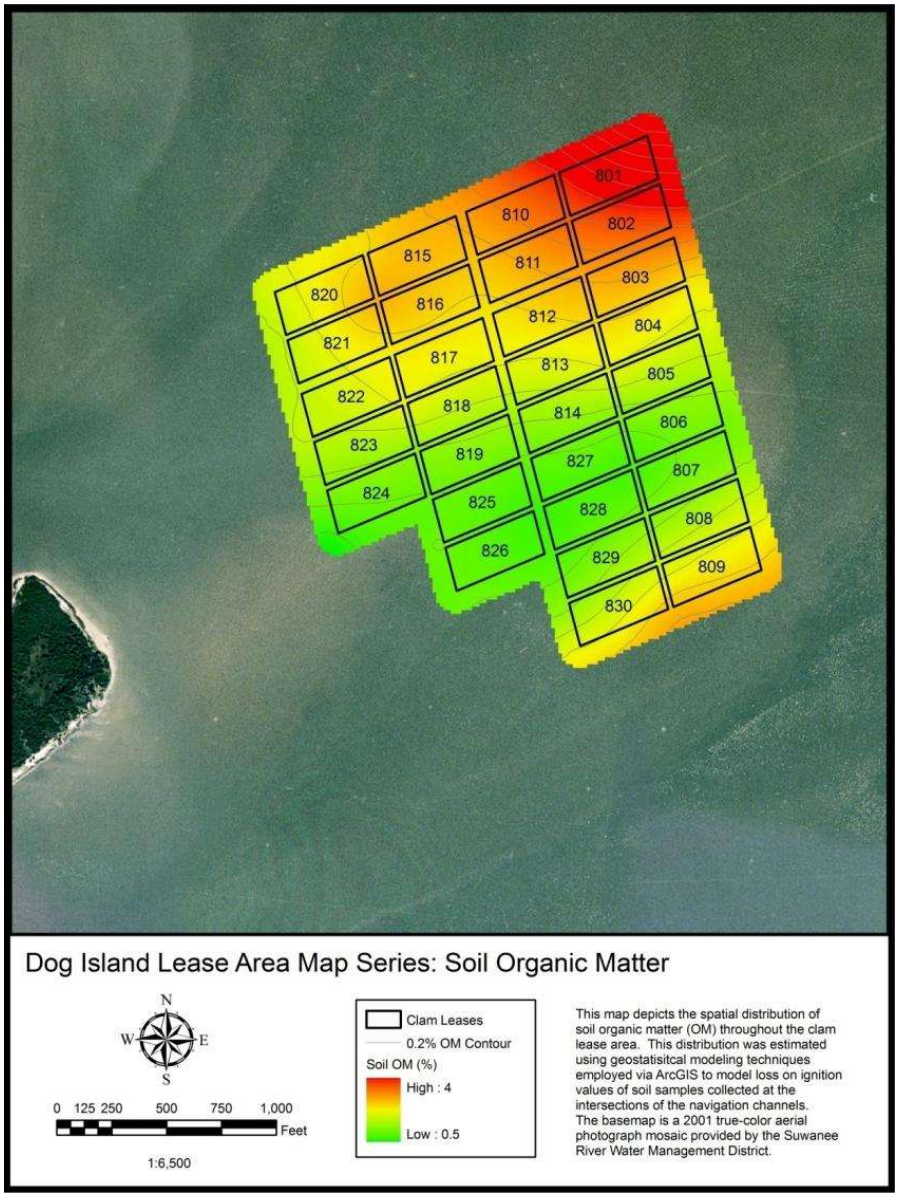
Soil Organic Matter

High OM

4%

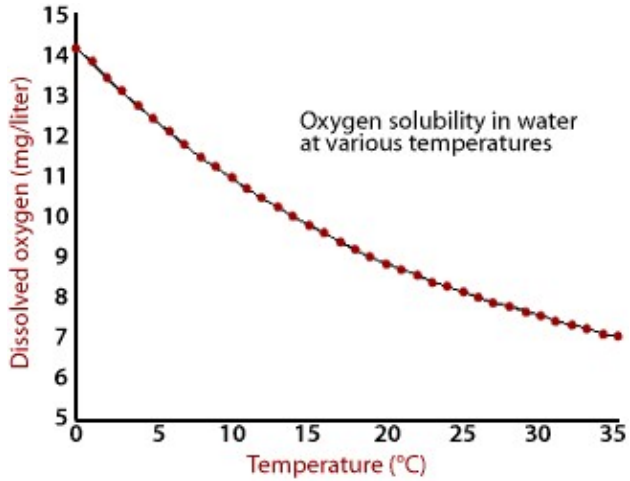
0.5%

Low OM



BACKGROUND

- High temps in summer increase hard clam mortality events
- Could be due to low oxygen (hypoxia), hydrogen sulfide toxicity or a combination of both that are brought about by increased temperatures
- Presence of organic matter (OM) influences hypoxia by stimulating respiration in microorganisms and can similarly fuel production of hydrogen sulfide.



Normal conditions:

OM + Oxygen = carbon dioxide + water+ energy

When oxygen is absent:

OM + sulfate = hydrogen sulfide + water + energy

METHODS

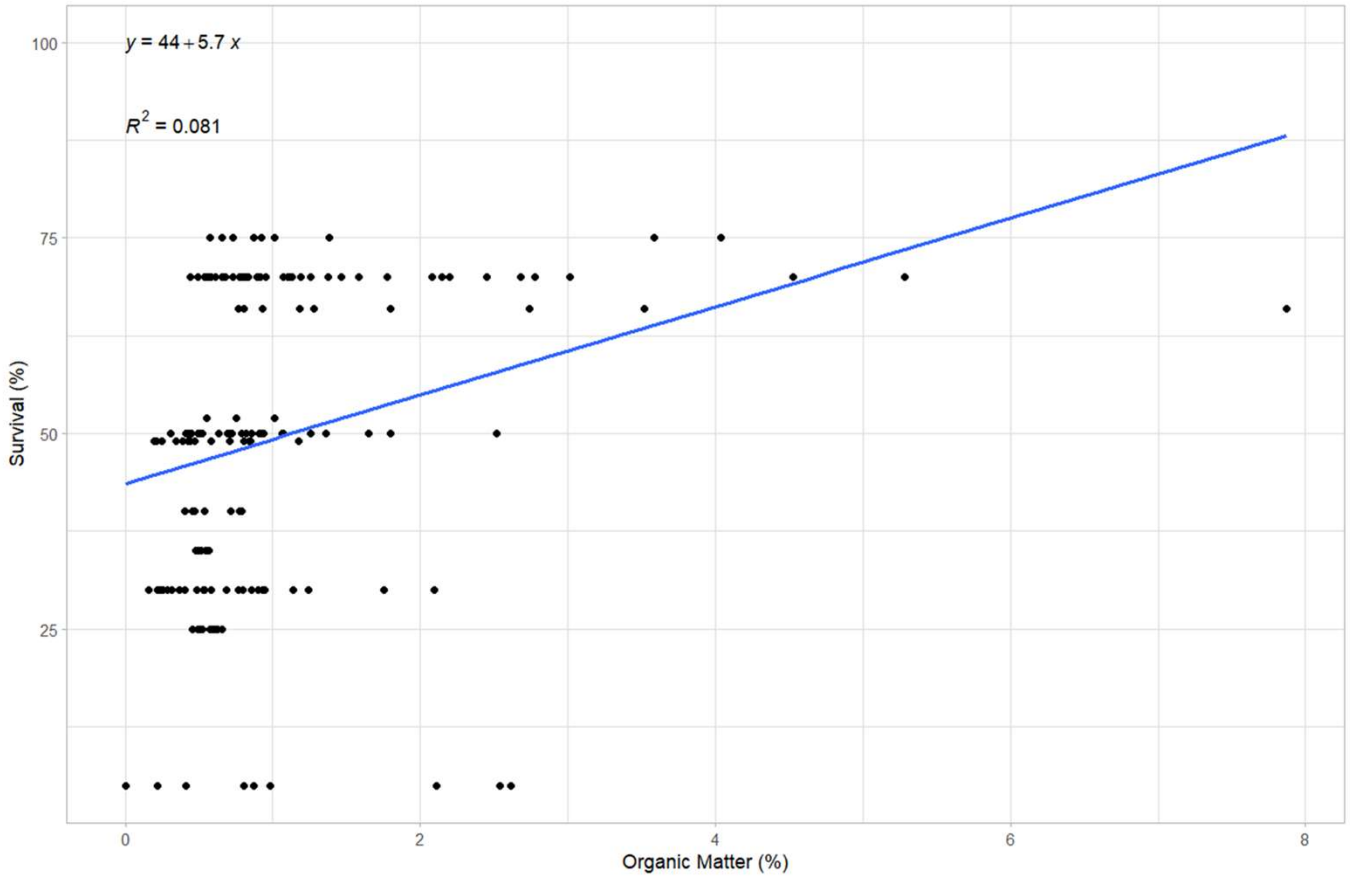
To test the hypothesis that sediment organic matter (SOM) may contribute to summer mortality events in hard clam culture:

- Participating growers sampled sediments monthly (June-August, October 2024) from three leases at Dog Island and three leases at Gulf Jackson
- Six replicate samples were taken alongside clam belts at harvest and 3 replicates from unfarmed area. Grower estimates of survival were reported at time of sampling
- Sediment organic matter (SOM) content was measured in laboratory by loss on ignition (LOI) method (combustion at 500 ˚C)
- SOM, water quality, and clam survivorship estimates were compared to investigate role of SOM in mortality

RESULTS

Total of 189 soil samples tested for SOM

Regression analysis of categorical observations of percent clam survival versus organic mater did not reveal a relationship between the variables

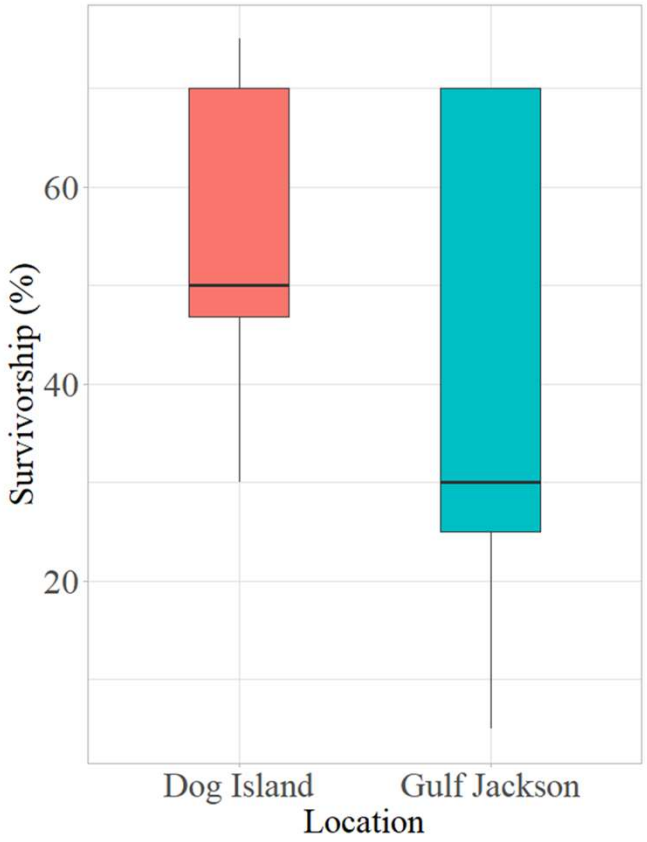


RESULTS

Box plots show the spread of the data, the line inside the box is the middle of the data

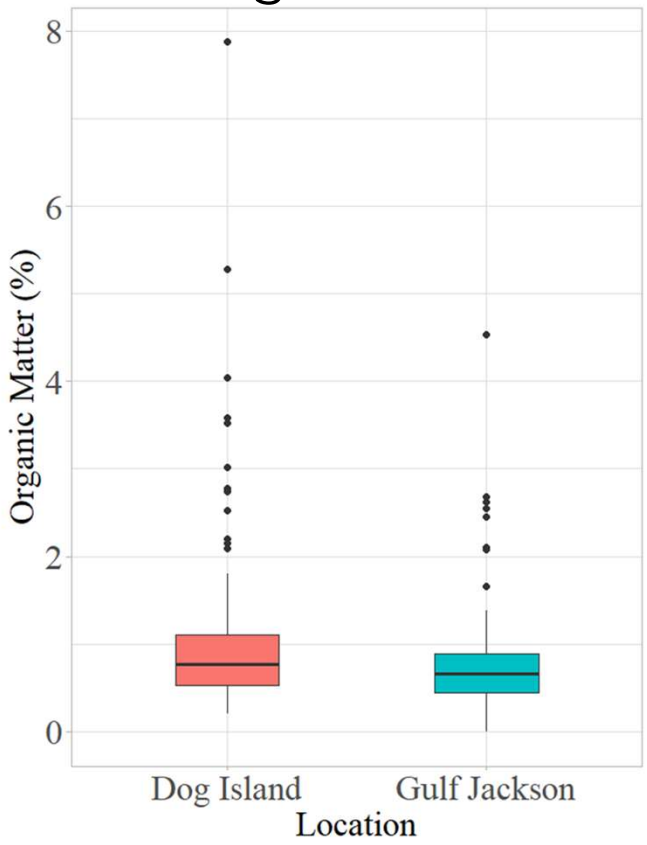
Dog Island shows significantly better survivorship vs Gulf Jackson while organic matter is virtually the same for both sites

Clam Survival



Kruskal-Wallis = **4.5×10^{-10}**

Organic Matter

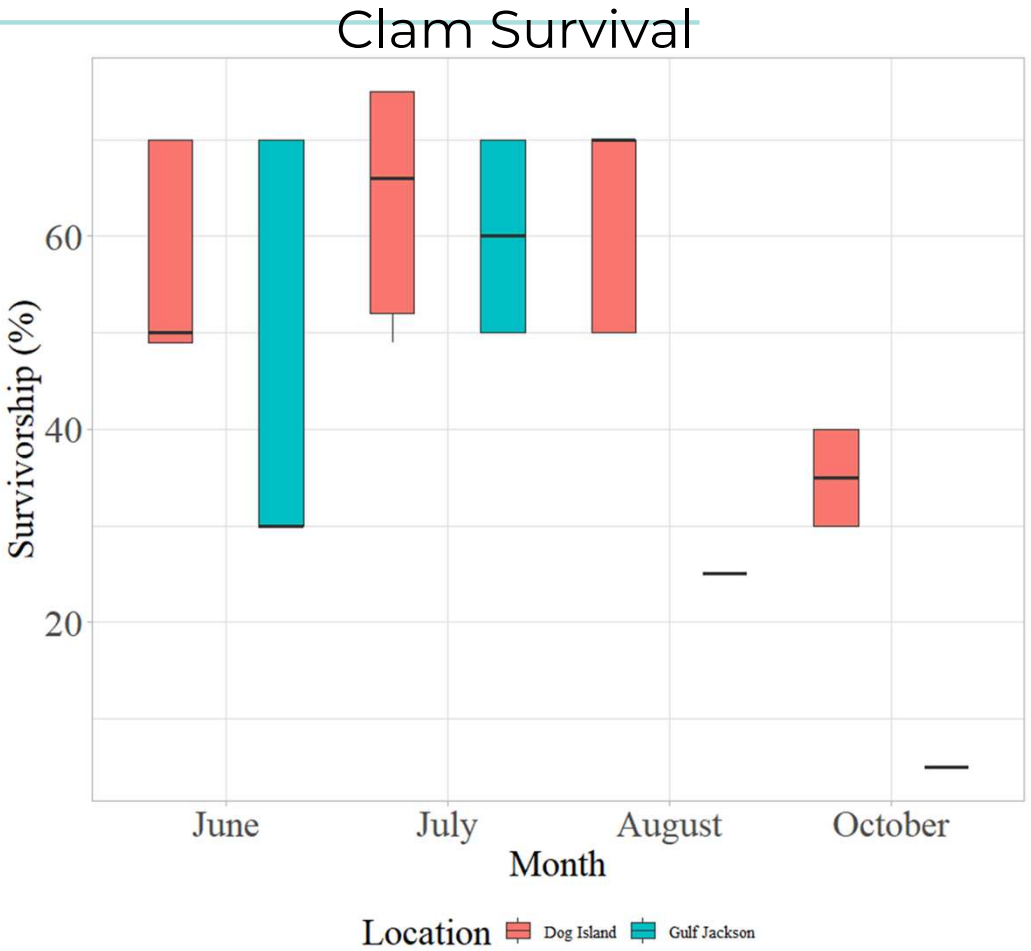


Kruskal-Wallis = 0.19

RESULTS

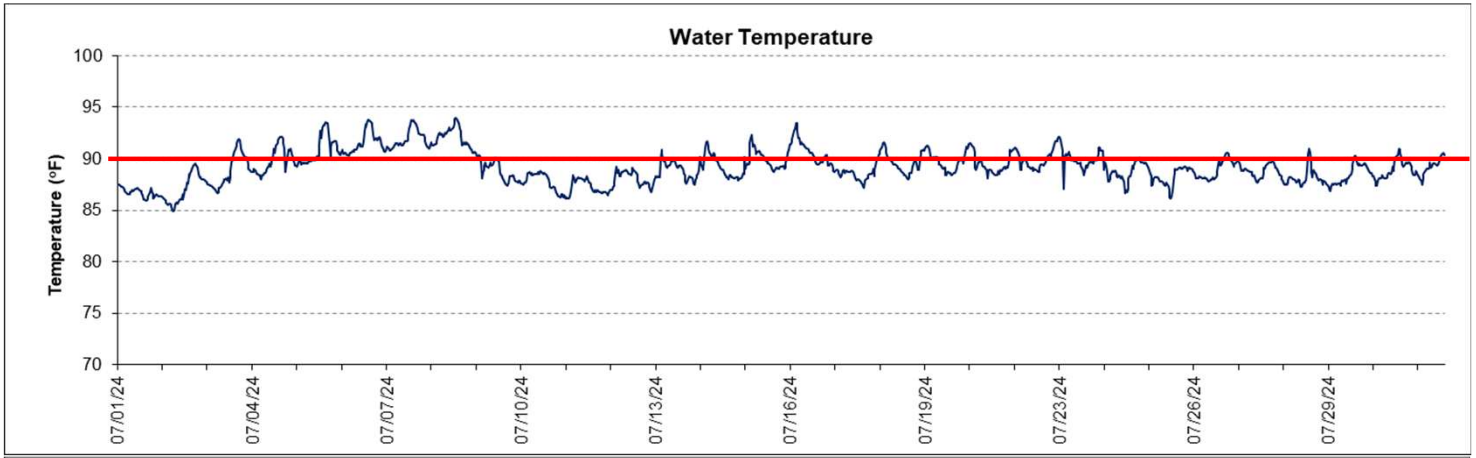
Dog Island shows significantly better survivorship vs Gulf Jackson for June, August and October indicating different stressor conditions and responses

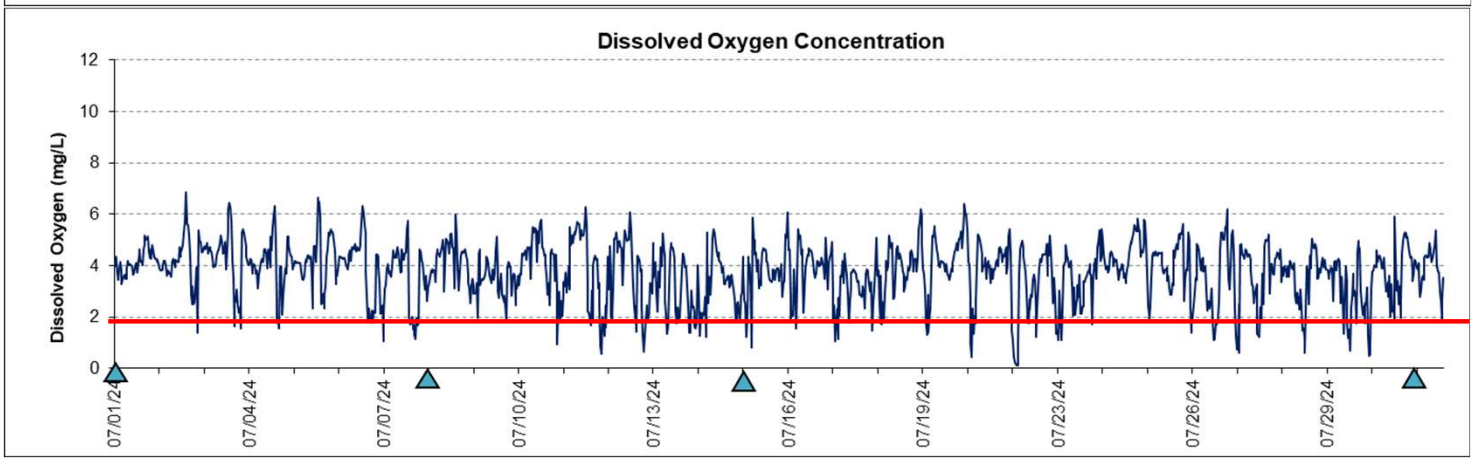
Note: post Hurricane Helene survival was much lower



RESULTS

Example WQ data: DI JULY





Water Quality data was spotty due to hurricanes and complicated direct comparisons of sites.

Redlines indicate the 90˚ F temperature (top) and hypoxia threshold (below) for Dog Island in July.

Illustrates lack of direct correlation between temp and hypoxia, suggests additional drivers involved in hypoxia conditions.

FINDINGS & IMPACTS

- SOM was not found to be a significant factor in hypoxia or mortality at DI and GJ leases
- DI and GJ had different survival over the summer
- Hurricane disturbance had a net removal effect for SOM but marked negative impact on clams
- Based upon available data, July DO was lowest at both sites in which hypoxia (<2mg/l) was most prominent
- Water Quality does not show direct temp to DO relationship suggesting additional variables (perhaps suspended OM) are influencing hypoxic conditions during excessive heat (we need to look deeper into this)

ACKNOWLEDGEMENTS

THANK YOU!

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- All clam growers who participated in these studies!