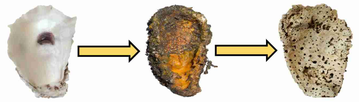
Boring Sponges on Oyster Reefs: Distance from Boating Channels and Impact of Boring Sponge Damage

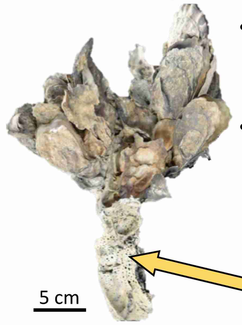
Katherine Harris and Linda Walters
Department of Biology, University of Central Florida, Orlando, FL 32816

Introduction

- Boring sponge (*Cliona celata*) bores holes into oysters, causing damage to the shells.



- This shell damage weakens oysters and makes oyster clusters more susceptible to breakage.
- *C. celata,* a subtidal species, has been observed on intertidal oyster reefs in Mosquito Lagoon (ML).

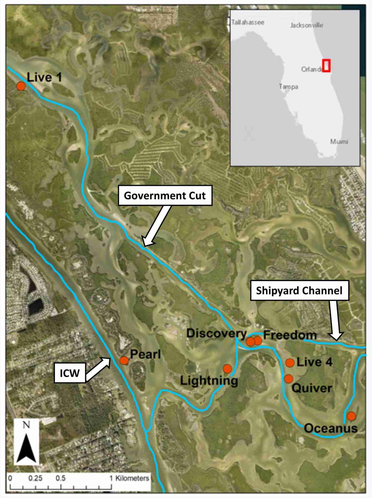


- Recreational boating in ML is known to dislodge oyster clusters and increase reef dead margins.
- Little is known about what contributes to boring sponge spread on reefs and if recreational boating plays a role in this process.

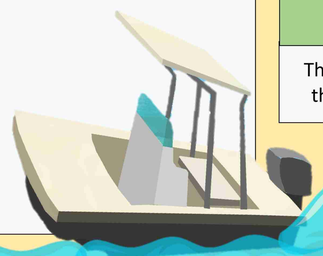
Research Questions

1) Where does boring sponge and bore hole damage occur on intertidal oyster reefs?
2) Is there a difference in the amount of sponge or boring damage on natural vs. restored reefs?
3) Do reefs closer to boat channels in ML have more boring sponge and boring damage than reefs farther away?

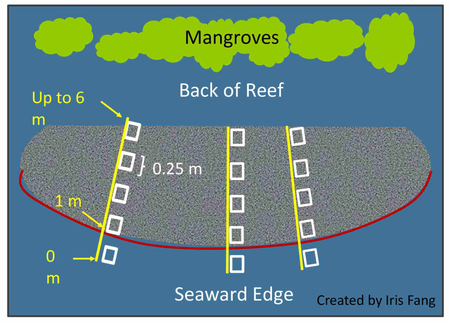
Study Site: Mosquito Lagoon



Legend:
- Boat Channels
- Oyster Reefs



Methods 1: Sponge Survey



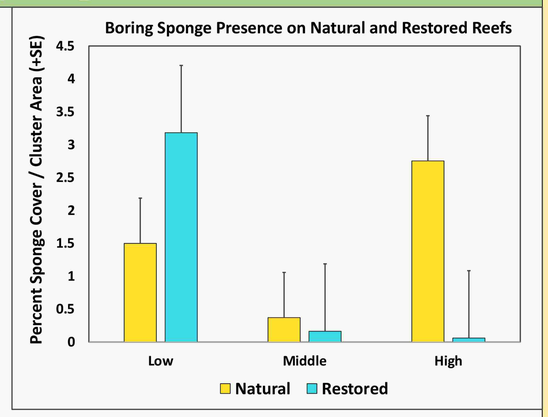
- Collected in summer 2017
- Surveyed 3 natural, 15 restored reefs for boring damage and sponge abundance
- Reefs surveyed with 3 transects perpendicular to seaward edge of reef, with quadrats a meter apart going up to 6m back on the reef along each transect
- Data collected per quad:
  - Height / width of oyster clusters
  - Surface area of sponge per cluster
  - Surface area of bore holes per cluster

Methods 2: GIS and Stats Analysis

- 2 natural and 6 restored reefs from the 2017 sponge survey were used in this analysis
- Used ArcMap measurement tool to measure and record the distance from the middle of commonly used boating channels to the closest reef edge of each reef.
- Analyzed the distance data with the sponge survey data in R Studio.
- T-tests and ANCOVAs were used to analyze sponge and boring area per cluster, grouped by low, middle, and high intertidal reef levels.

Results: Sponge Presence

- Live boring sponge was found on all reefs except for one restored reef.
- Middle reef levels had significantly less live sponge area than low and high reef levels ($p < 0.001$ for both).
- Natural reefs had significantly more sponge area than restored reefs ($p=0.002$), specifically at the high reef level ($p=0.0001$).
- Reef distance from boat channels had no clear significant affect on sponge area for low / middle reef levels.

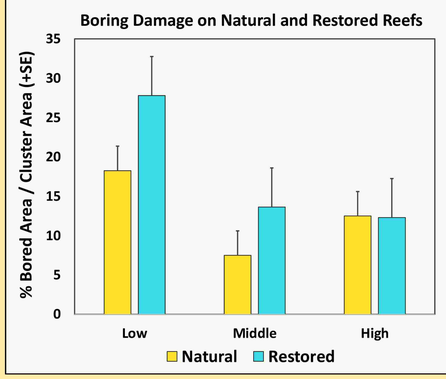


- However, for natural reefs, high levels were significantly affected by distance from boat channels, with farther distances suggesting a decrease in sponge area ($p=0.01$).

Acknowledgements

Thank you to Canaveral National Seashore, University of Central Florida, Department of Biology for access to this data, and to Aylesworth Scholarship, Florida Sea Grant, NSF, IRL NEP for scholarship and grant funding.

Results: Boring Damage

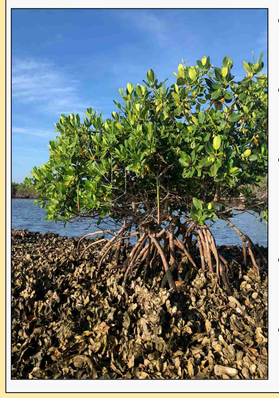
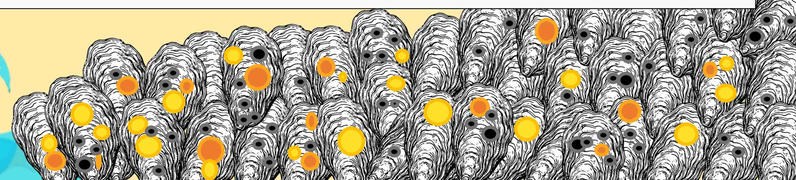


- All reef levels had boring damage, but low reef levels had significantly more boring damage than middle and high levels ($p < 0.001$ for both).
- Natural and restored reefs did not have significantly different amounts of boring damage ($p > 0.5$).
- Distance from boat channels had no clear significant affect on bored area at any reef level.

Discussion

- As a subtidal species, *C. celata* is expected to be found mainly around the edges of intertidal oyster reefs. However, results suggest boring sponges and boring damage are present on middle / high intertidal reef levels in ML.
- Boring damage was most common on the lowest reef levels, but live sponge was most common on low and high reef levels.
- This analysis suggests proximity to common boat channels may contribute to increased sponge presence higher on reefs, especially natural reefs.
- Recreational boating in ML can dislodge oyster clusters. With an average of 9 boats/hour creating wakes on reefs, sponge infected shells may be dislodged and rolled to high intertidal reef level where sponge may spread through contact with other shells.

Future Directions



- The interaction between oyster reefs, boring sponges, and mangroves.
- Mangroves decrease local pH, possibly contributing to localized acidification on reefs with mangroves.
- I will study oyster shell dissolution on reefs with and without mangroves – comparing bored and non-bored shell dissolution.
- Boring sponges are known to have higher rates of boring on shells weakened by acidification.
- I will study the impact of boring sponges on live oysters and disarticulated shell at decreased pH.