IMPACTS OF LARGE-SCALE BREAKWATERS ON SHORELINE VEGETATION IN HIGH WAVE ENERGY ENVIRONMENTS

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Introduction

- Shoreline erosion threatens the coast and the many ecosystem services it provides
- To combat erosion and preserve benefits, land managers often install nearshore breakwaters to attenuate wave energy
- These breakwater projects are often termed "living shorelines" due to the perceived increase in secondary productivity and preservation of natural shorelines
- However, evaluations of the effectiveness of breakwaters at preserving natural shorelines are limited

Study Site

- 4.8 km of eroded shoreline in Bon Secour Bay, AL
- 4 Breakwater study areas: North No Breakwater (NNBW), Recent Breakwater (RBW), Old Breakwater (OBW), and South No Breakwater (SNBW) areas
- Plot treatments: Planted *Spartina alterniflora*, Natural *Spartina alterniflora*, and Bare

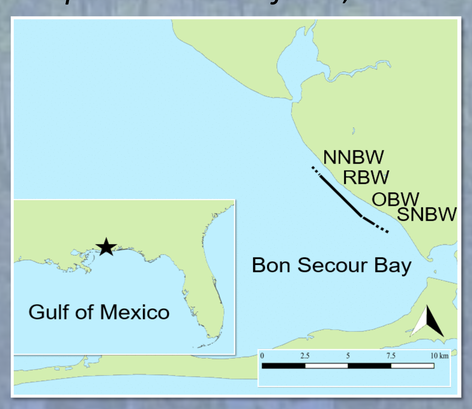

Figure 1. Inset: Star indicates the location of the Bon Secour Bay study site along the northern Gulf of Mexico; Study site is shown with letters indicating the North No Breakwater (NNBW), Recent Breakwater (RBW), Old Breakwater (OBW), and South No Breakwater areas (SNBW).

Figure 2. Photo from study site showing the high level of erosion along the shoreline.

Methods – Fixed Plot Sampling

- Sampling has been done 7 times over 3 years in the OBW and SNBW study areas
- Plant heights and species percent cover data was collected in each plot at every sampling date

Figure 3. Example photos of: A) Natural plot; B) Planted plot; C) Bare plot

Methods – *Spartina alterniflora* Shoreline Mapping

- All study areas of the shoreline have been surveyed 3 times using a Real Time Kinetic (RTK) Global Positioning System (GPS) to monitor changes in natural stands of *Spatina alterniflora*.

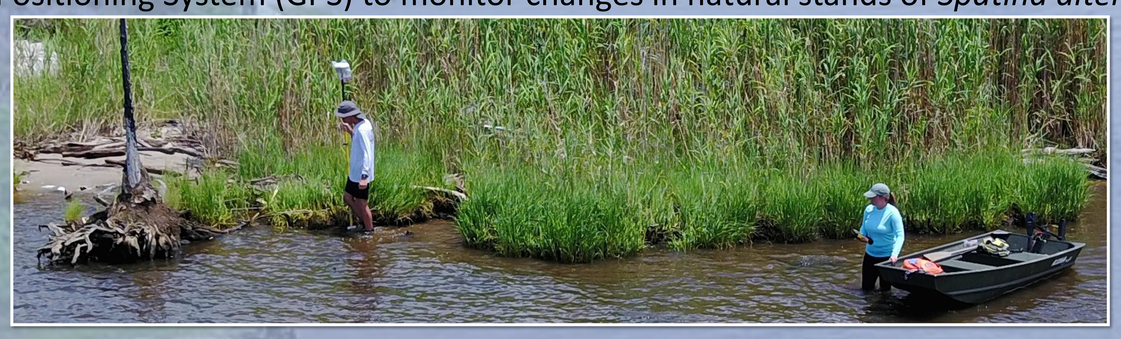

Figure 4. RTK survey of a natural *Spartina alterniflora* patch along the study shoreline.

Results

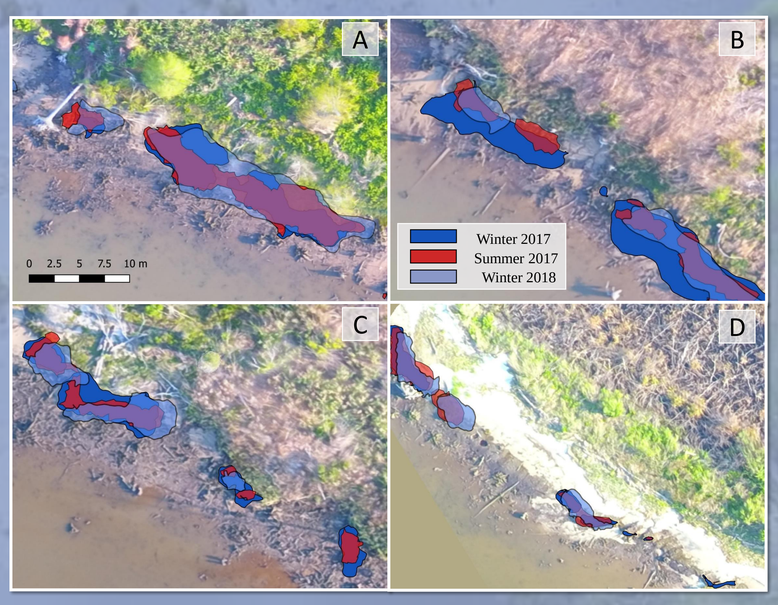

Figure 5. Examples of *Spartina alterniflora* RTK polygon patches used in data analysis. Dark blue represents Winter 2017, red represents Summer 2017, and light blue represents Winter 2018 samplings. A) South no breakwater (SNBW). B) Old breakwaters (OBW). C)Recent breakwater (RBW). D) North no breakwater (NNBW).

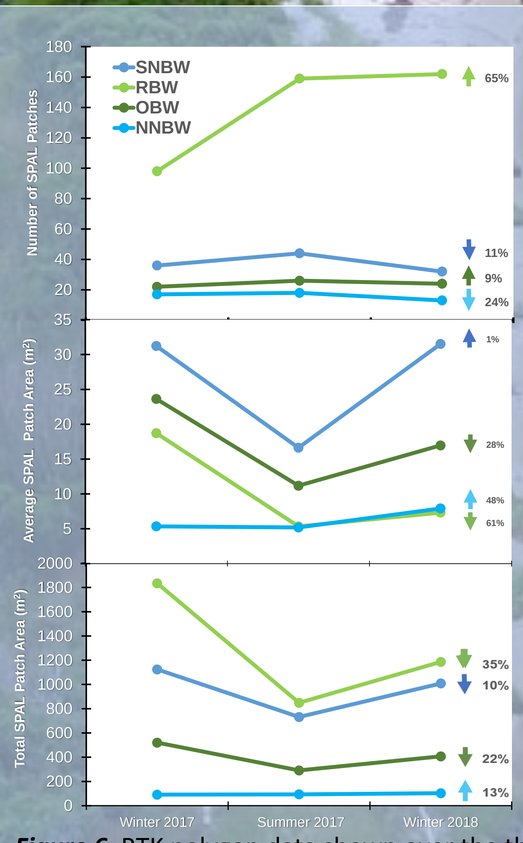

Figure 6. RTK polygon data shown over the three sampling periods: A) *Spartina alterniflora* patch count, B) Mean patch area, C) Total area per treatment type.

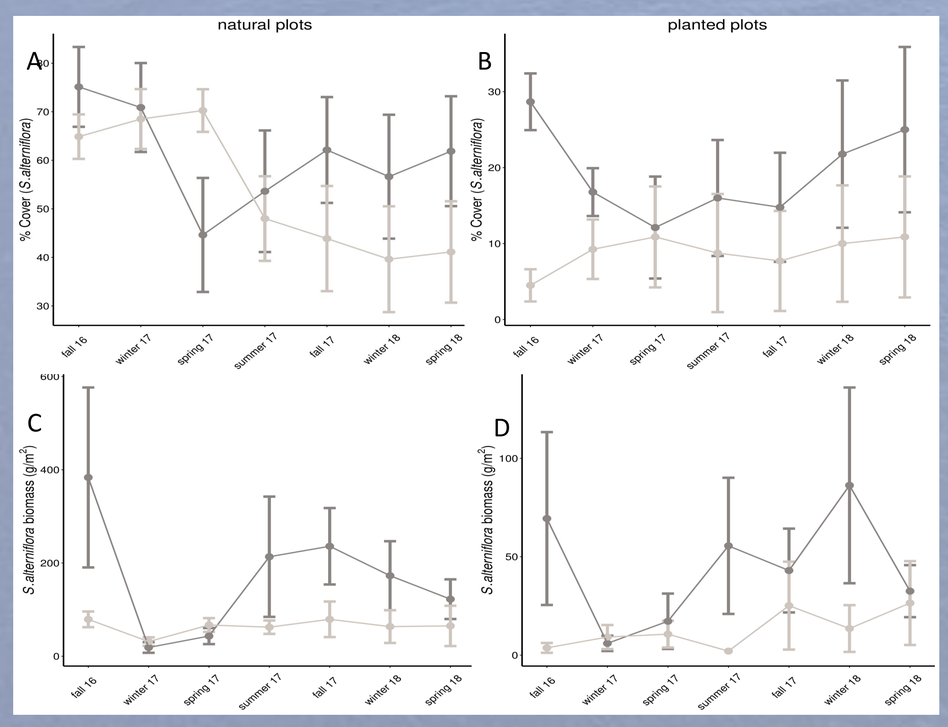

Figure 7. Fixed *Spartina alterniflora* sampling data is shown over 7 sampling dates. Darker lines represent breakwater data with lighter lines indicating no breakwater data : A) Percent cover of natural plots is shown, B) Percent cover of planted plots, C) Biomass of natural plots, D) Biomass of planted plots.

Conclusions

- Study site is dynamic and diverse
- To date, breakwaters have not been shown to enhance shoreline vegetation
- Further research into potential driving factors (e.g., small-scale wave energy, flow, and sediment studies) is needed
- Long term trends in shoreline vegetation and site characteristics should be considered prior to breakwater construction

Next Steps

- Continue sampling through March 2019
- Incorporate drone elevation mapping
- Determine flow rates between, behind, and in front of the breakwaters

Funders

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