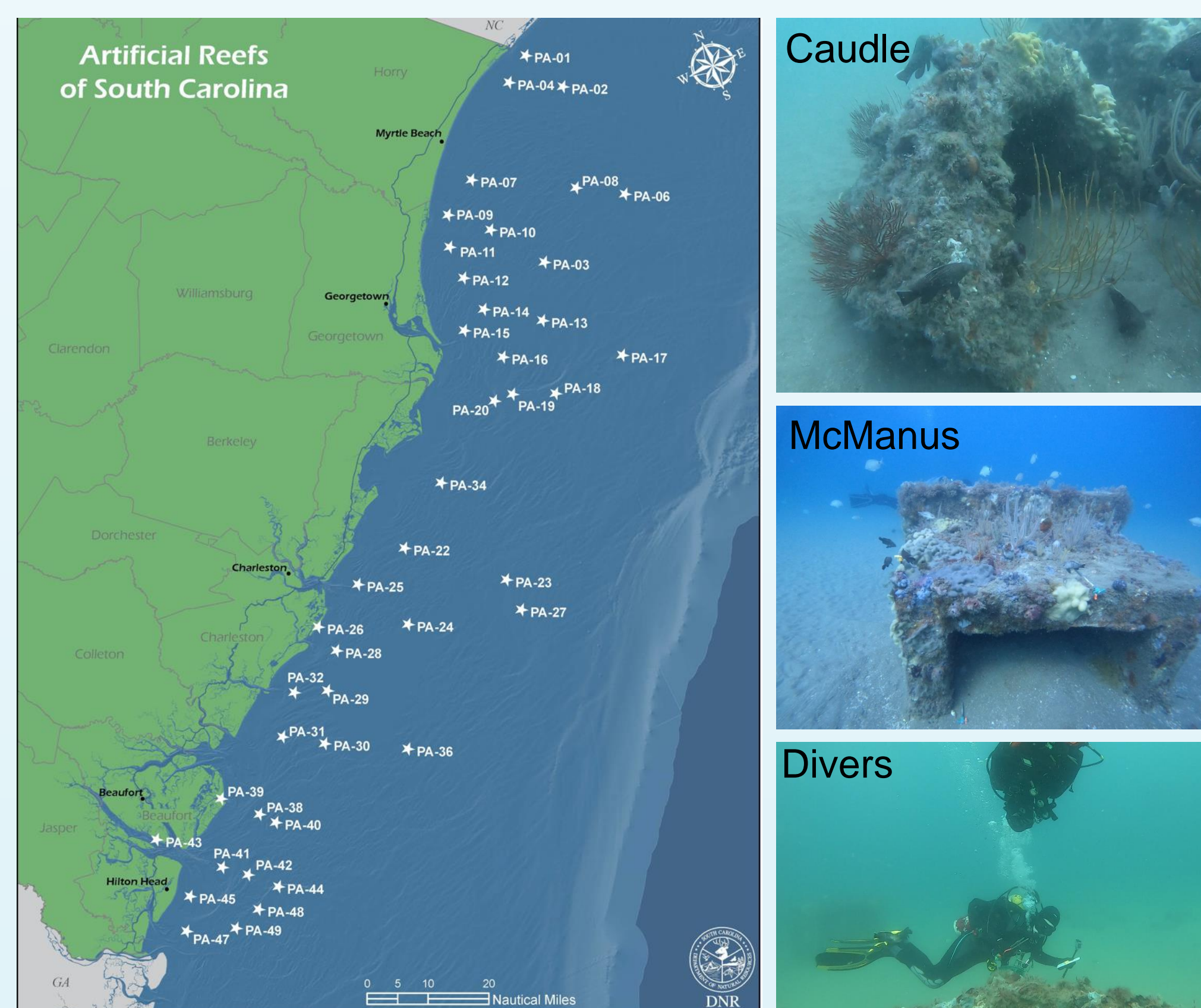


# What lives on offshore artificial reefs in South Carolina? An analysis of epifaunal reef communities and how they vary with reef age

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## Intro

- Sportfishing is one of the highest economic revenues of South Carolina contributing to \$1 billion of economic output.
- Beginning in the 1830s, fishermen would place log huts into the marine environment to improve fishing.
- South Carolina Department of Natural Resources (SCDNR) has expanded to over 40 established artificial reef sites, primarily to improve fishing
- Artificial reefs provide three-dimensional relief and hard substrate for epifauna to attach.
- Epifauna can provide important food resources for economically important fish.
- It is important to evaluate how these epifauna communities vary with age to understand if potential food resources and habitat quality improves overtime.



## Objectives

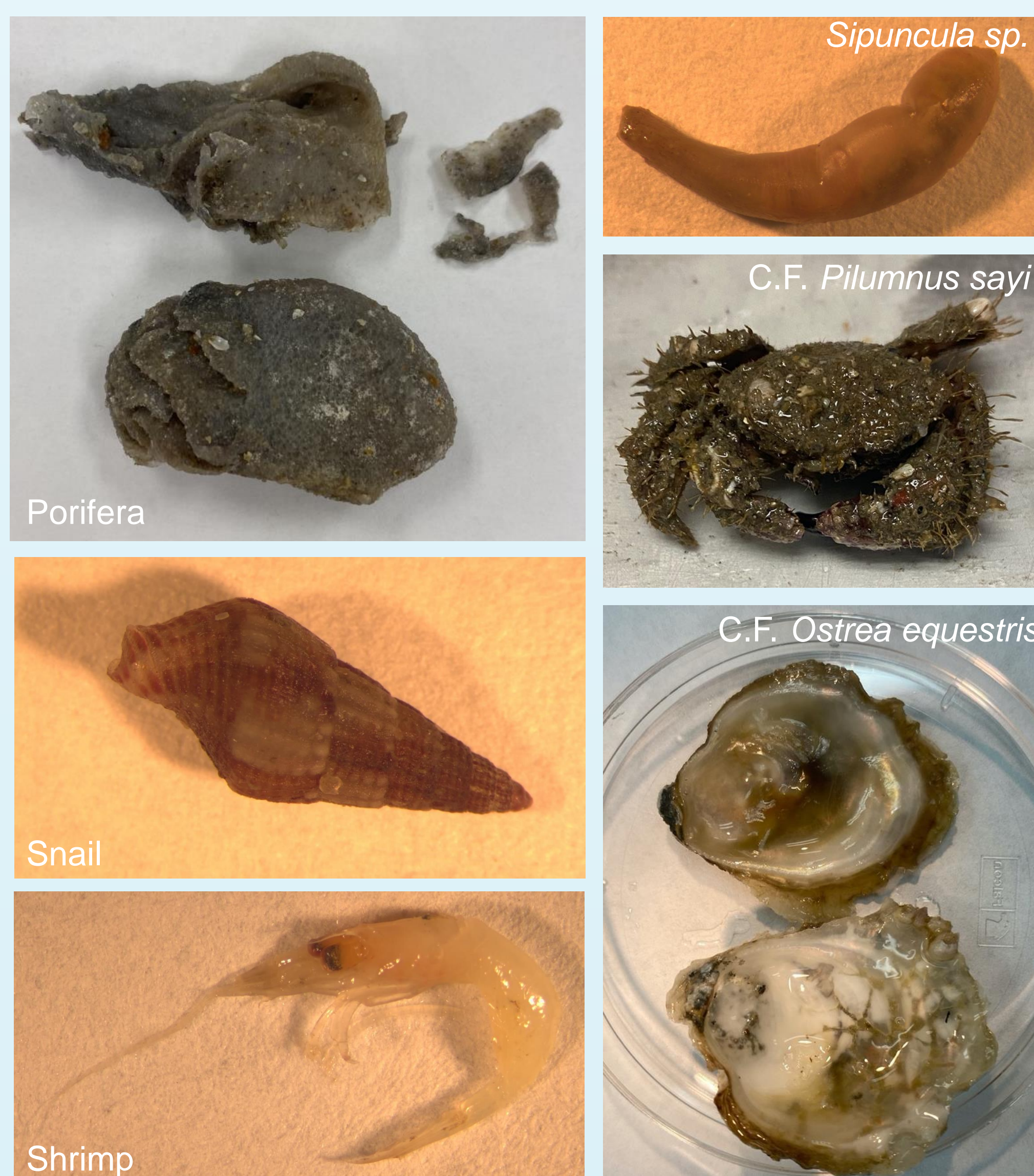
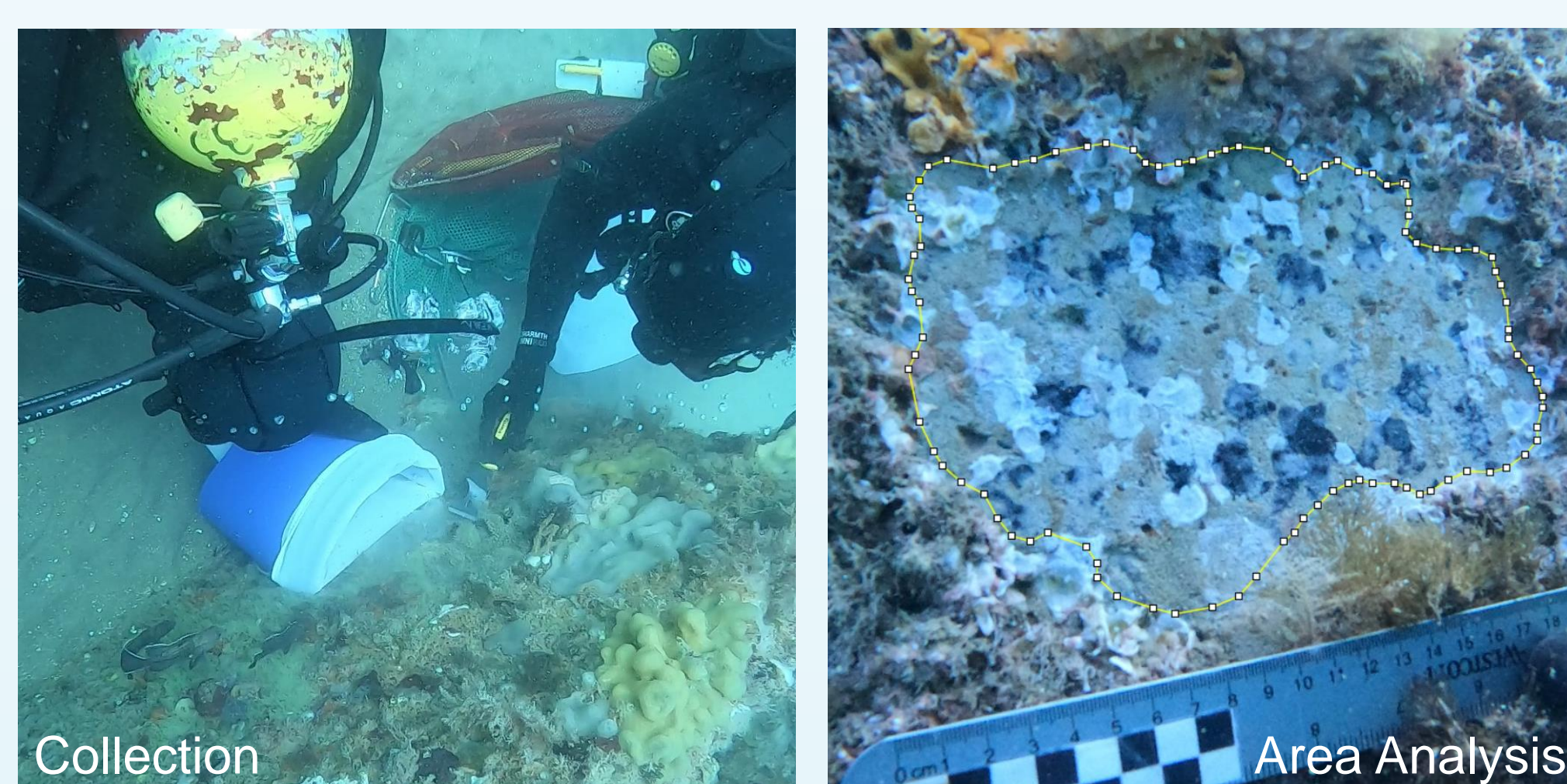
- To evaluate and compare sessile and motile macrofauna biomass of two offshore artificial reefs, Jim Caudle Reef (PA-01) and Ron McManus Memorial Reef (PA-04), of different ages
- To create structure-from-motion (SfM) photogrammetry of the artificial reefs

## Hypothesis:

The older artificial reef blocks at Caudle Reef will support more biomass per square-meter in comparison to the newer artificial reef blocks at McManus Reef.

## Methods

- A dive team collected scrapings ~20 cm x 20 cm from artificial reef blocks
- 9 samples at Jim Caudle (Age =) Reef and 9 at Ron McManus Memorial Reef (Age =)
- The materials were transported back to the lab where they were weighed for biomass and density. The organisms were photographed for later identification.
- ImageJ was used to determine actual area of each scraping.
- Agisoft Metashape was used for SfM analysis
- T-tests were used to compare sessile and motile macrofauna biomass, and motile macrofauna density between reefs



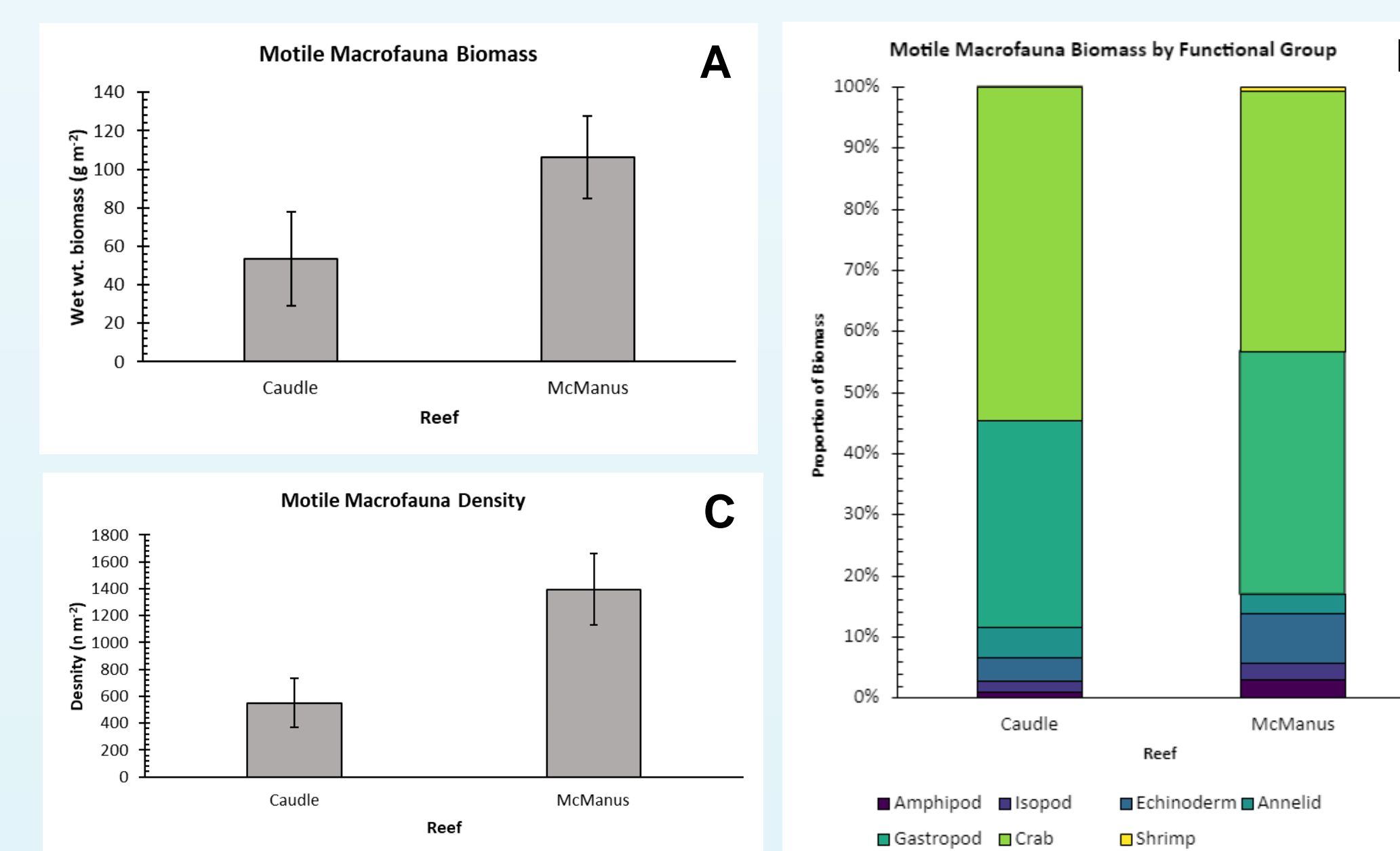
## Results

### Biomass and Density

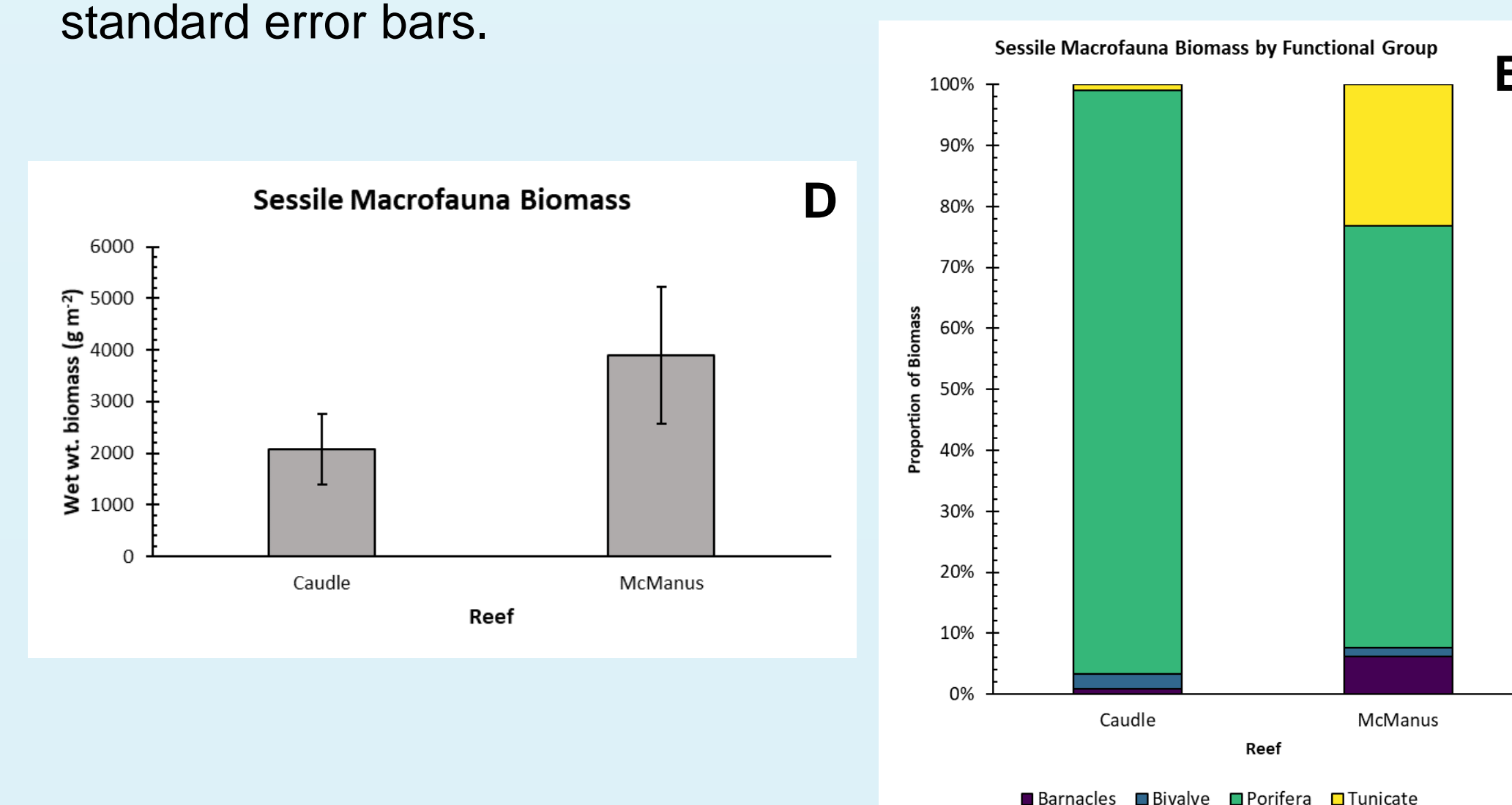
- McManus (ages 1-12 years) had significantly higher motile macrofauna density (mean = 1367.8 n m<sup>-2</sup>) than Caudle (mean = 563.6 n m<sup>-2</sup>) (p=0.023\*), but no significant difference between motile macrofauna biomass was found between reefs (p = 0.123)
- Sessile organism biomass did not differ between Caudle and McManus Reef (p=0.239).

### Community

- Most abundant motile organisms were crabs and gastropods on both reefs. Sponges dominated the sessile biomass.
- Caudle's (older reef) motile community had a relatively higher proportion of crab biomass than McManus.
- McManus' (younger reef) sessile community biomass had a much larger proportion of barnacles and tunicates than Caudle.



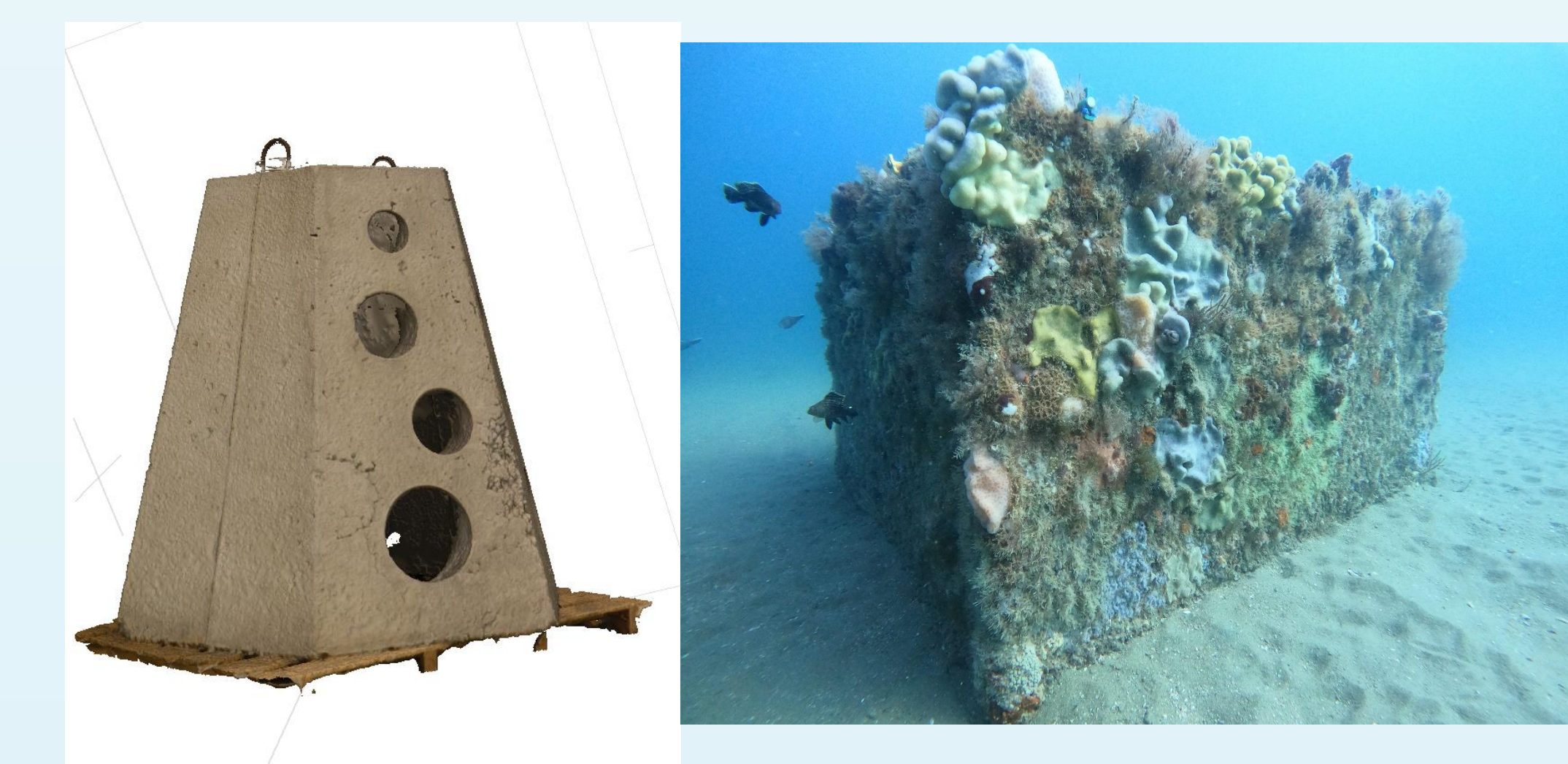
Figures: Plot A compares the wet weight biomass of motile macrofauna (g m<sup>-2</sup>) to each respective reef with mean and standard error bars. Plot B shows the proportion of motile biomass across both reefs. Plot C denotes the density (n m<sup>-2</sup>) of the reefs with standard error bars.



Figures: Plot D compares the wet weight biomass of sessile macrofauna (g m<sup>-2</sup>) to each respective reef with mean and standard error. Plot E shows the proportion of sessile biomass of the reefs.

## Discussion

- Artificial reef habitats in South Carolina support 3 kg of sessile macrofauna biomass and 80 g of motile macrofauna biomass per square meter on average.
- Biomass does not necessarily increase with age on artificial reefs at the resolution evaluated in this study.
- Higher motile macrofauna densities in McManus could be related to an earlier successional stage or lower predation pressure at the younger reef.
- Spatial differences were not controlled for, an alternative explanation is that the little river plume reduces productivity at Caudle due to shading or the stress of sediment removal on filter feeders.
- Both types of reefs provide structure and habitats for smaller organisms ranging from 3 to 0.2 cm
- Fish were observed at both sites on every sampling excursion
- SfM Photogrammetry creates the best product on days with high visibility and on blocks with hard substrate without gorgonians or algae



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