

Enhancement of recruitment on restoration sites using hatchery oysters

Objectives:

- Assess the efficacy of using hatchery produced juveniles (spat-on-shell) to enhance spat levels and significantly increase market sized oysters above bare shell controls. Use ABSI restoration reefs as experiment sites.
- Investigate other methods of recruitment enhancement; e.g larger hatchery juveniles to encourage gregarious settlement on newly restored substrate
- Develop stock enhancement methods for large scale restoration.



RESTORATION EXPERIMENTS

Objective: Identify optimal location, materials and configuration for restoration success



Restoration experiments spring 2021

H_0 : NSD in different oyster size classes
(spat = <25 mm, seed 25-75 mm, market >75 mm)
between materials or sites.



Materials:

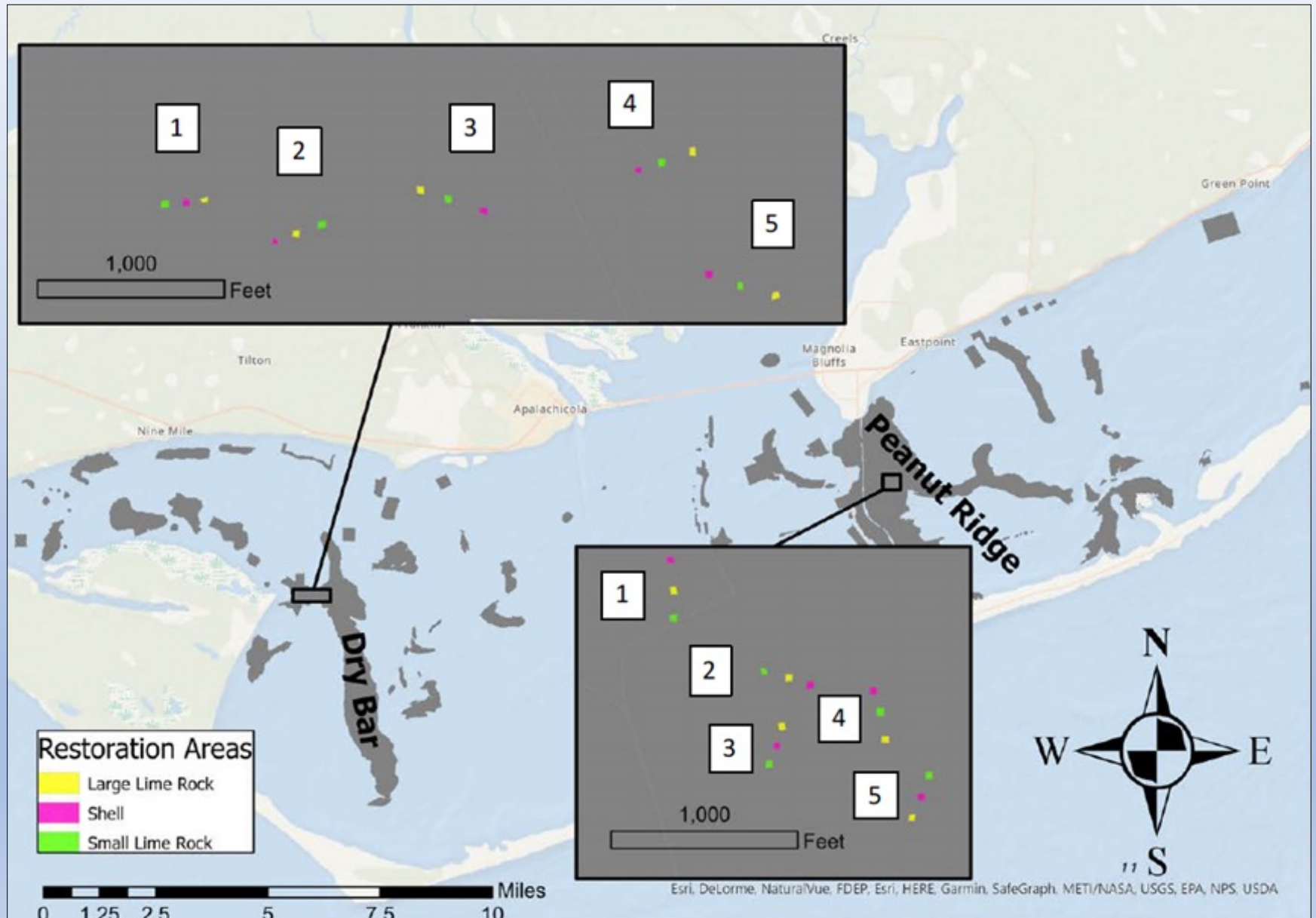
- Natural oyster shell – good for spat settlement, can be harvested with tongs. Light and unstable in strong currents
- Small limestone (~5 cm) - creates packed mound, small spaces, many layers, can be harvested with tongs. Relatively stable in currents.
- Medium limestone (15-20 cm) – creates stable structure, medium spaces, few layers, good for habitat development, can be harvested with tongs but not easily.

Reef height: 45 cm

Replicates: 5 per treatment

Sites: Dry Bar (west side of Bay) and Peanut Ridge (east side of bay)

Restoration Experiment Sites

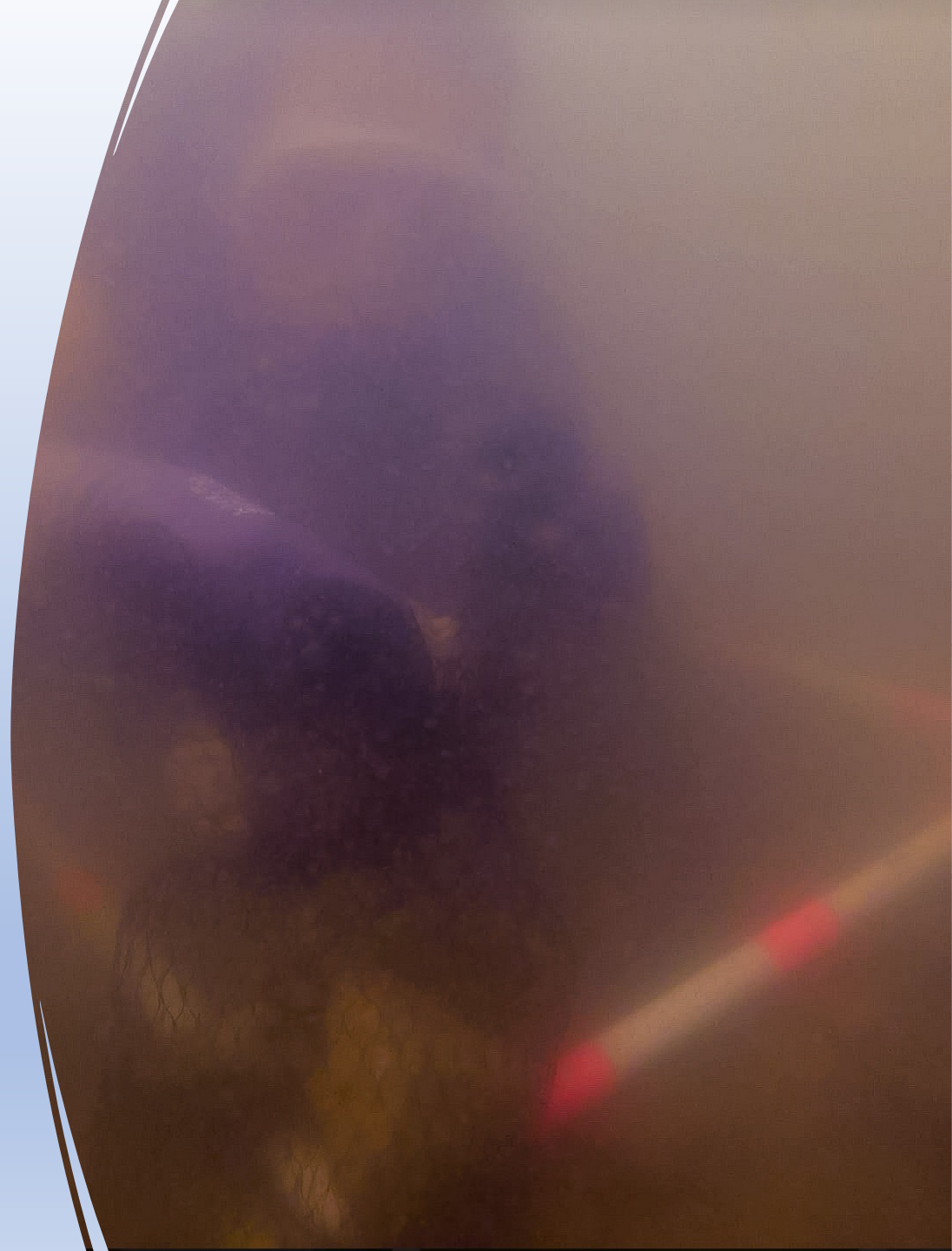


Diver sampling of ABSI restoration experiments

August 2022

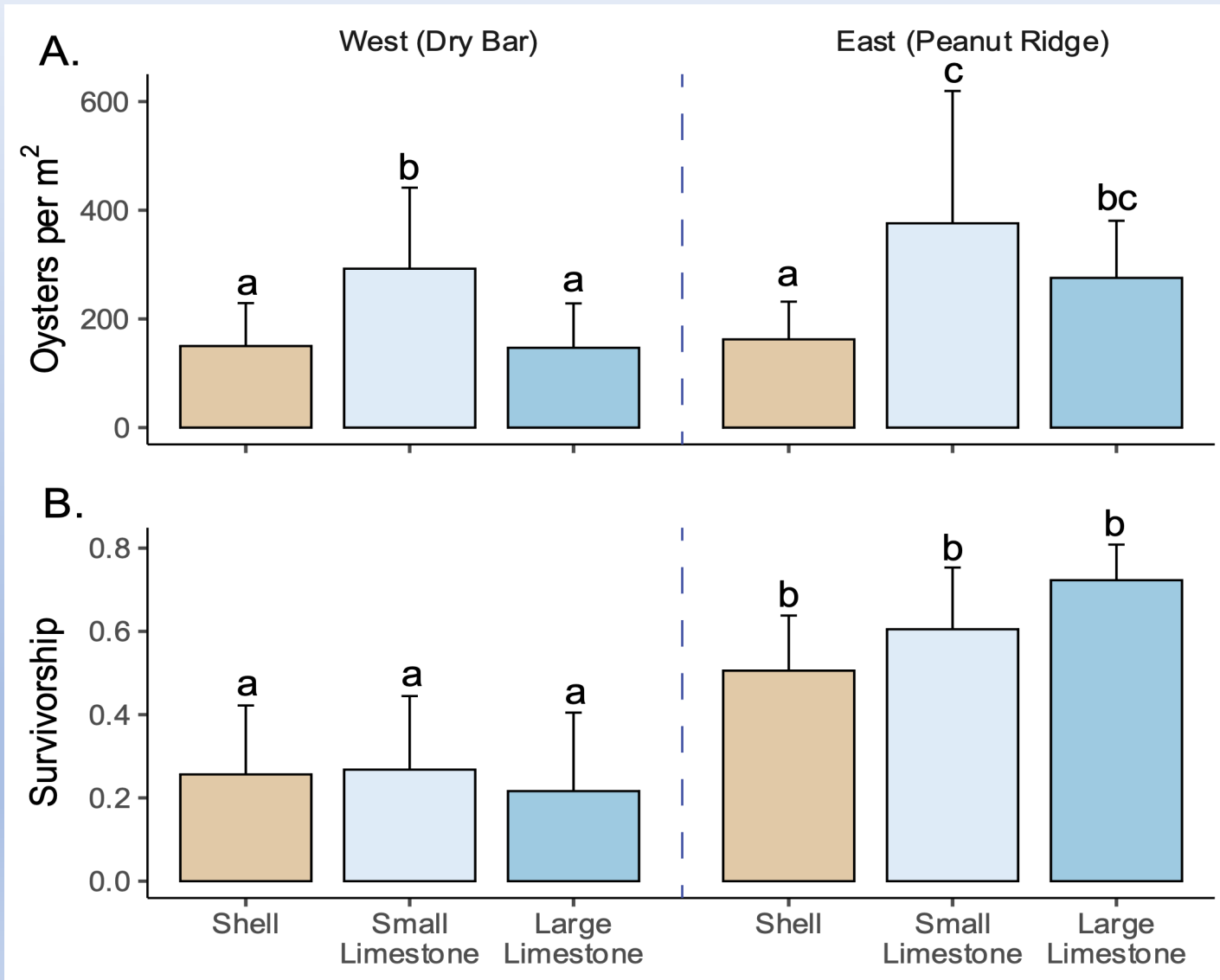


- Five x 0.25 m² quadrat samples per reef
- Volume: Rock, dead shell, live oysters
- Counted and measured live oysters and boxes



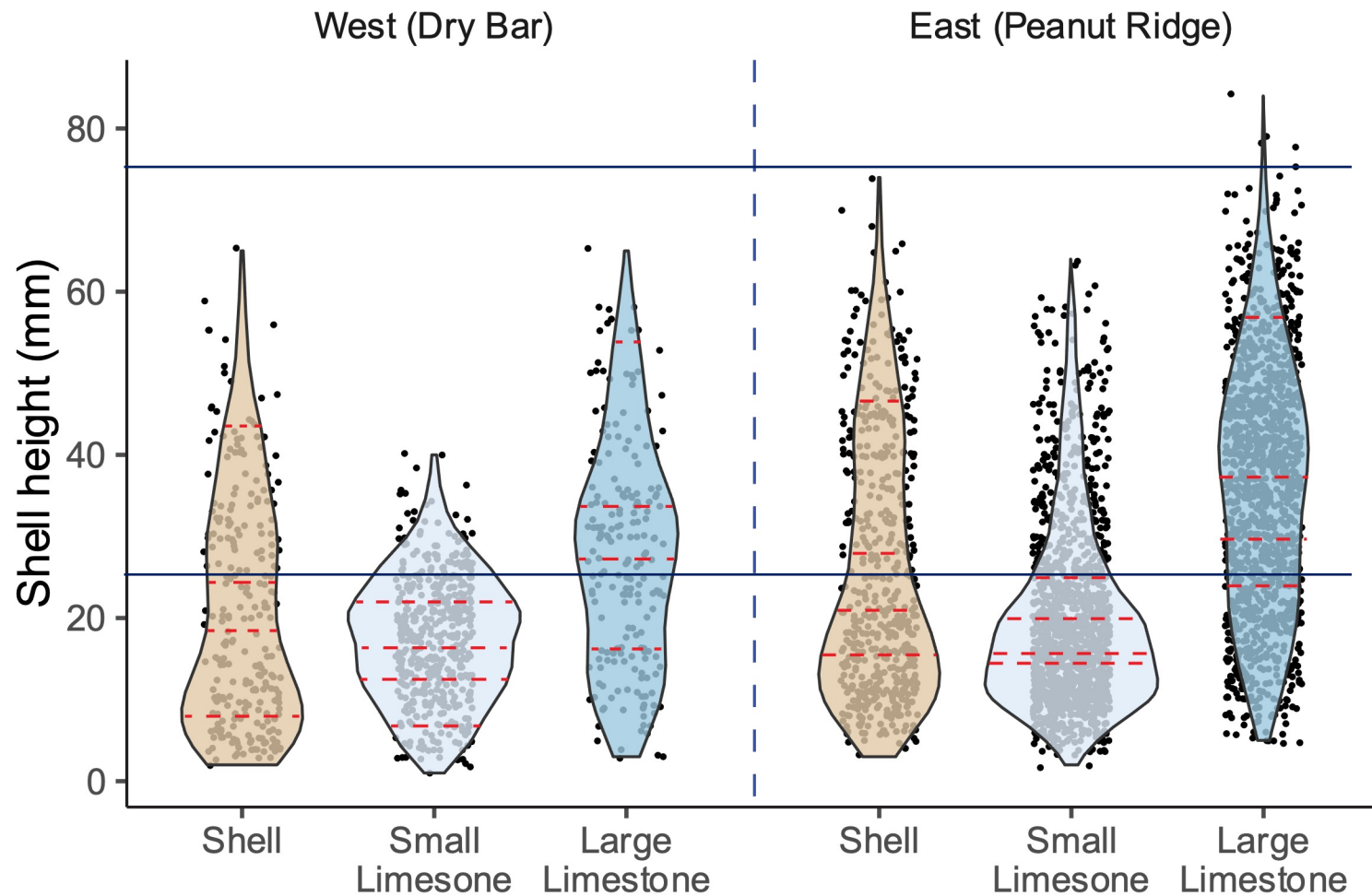
Restoration reefs – 14 months post-deployment

Density and Abundance



Restoration reefs – 14 months post-deployment

Shell Height



Tong sampling of ABSI restoration experiments

Aug-Sept 2022



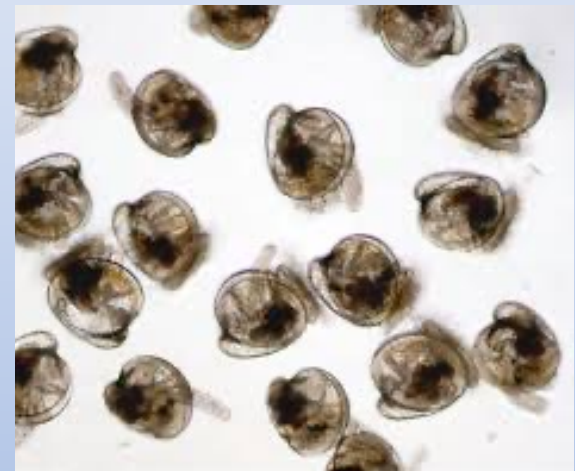
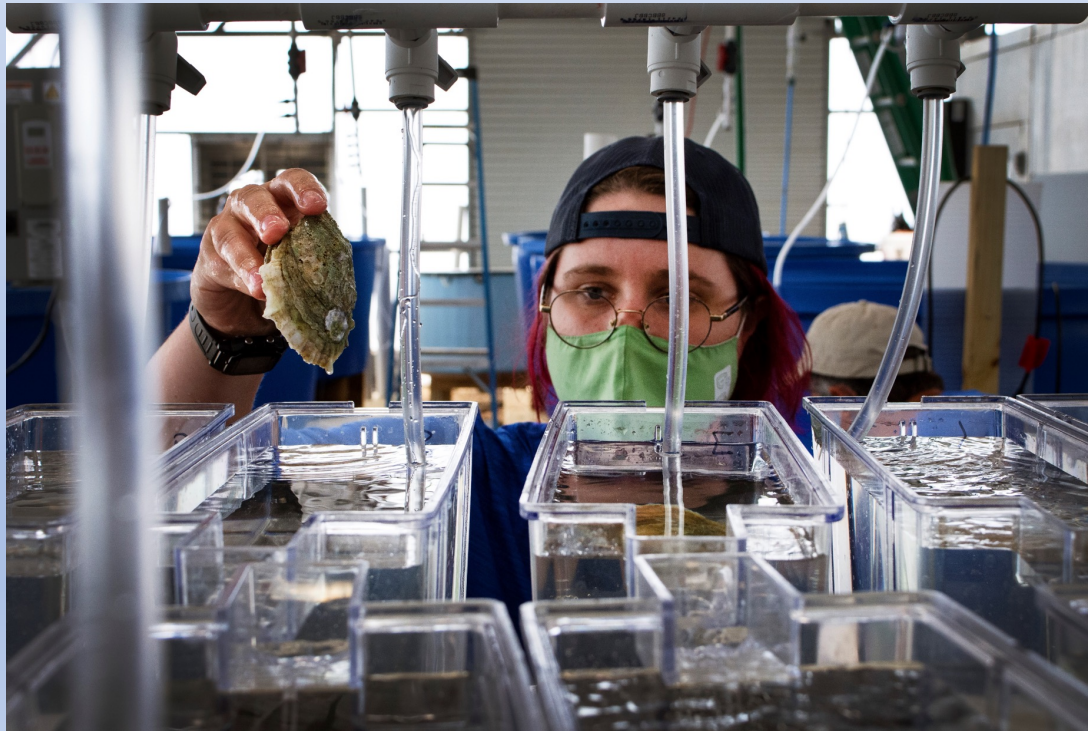
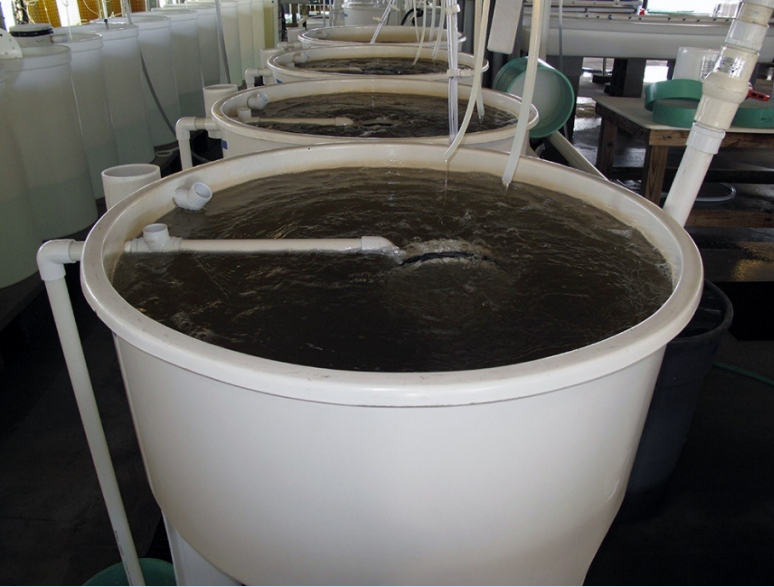
ABSI TEMPORARY HATCHERY ~ 2021

First successful spawn May 7th

Larvae set May 26th

Deployed June 15th (20 days post-set)

Spawned again June 8th (3.5 million larvae)



Spat deployment

Quantitative assessment of spat survival and growth

Vexar cages (14" x 36" x 4") weighted with rocks

Spat cages (one per restoration reef): 150 spat on shell per cage (~ 50 shells)

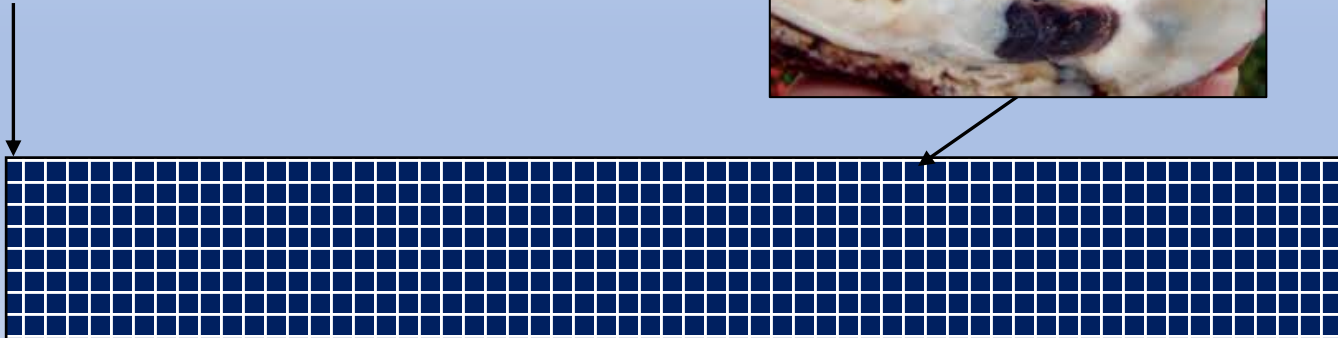
Control (one per reef): 50 clean shells per cage to account for wild recruitment

Quarterly : subsample cages and document survival and growth

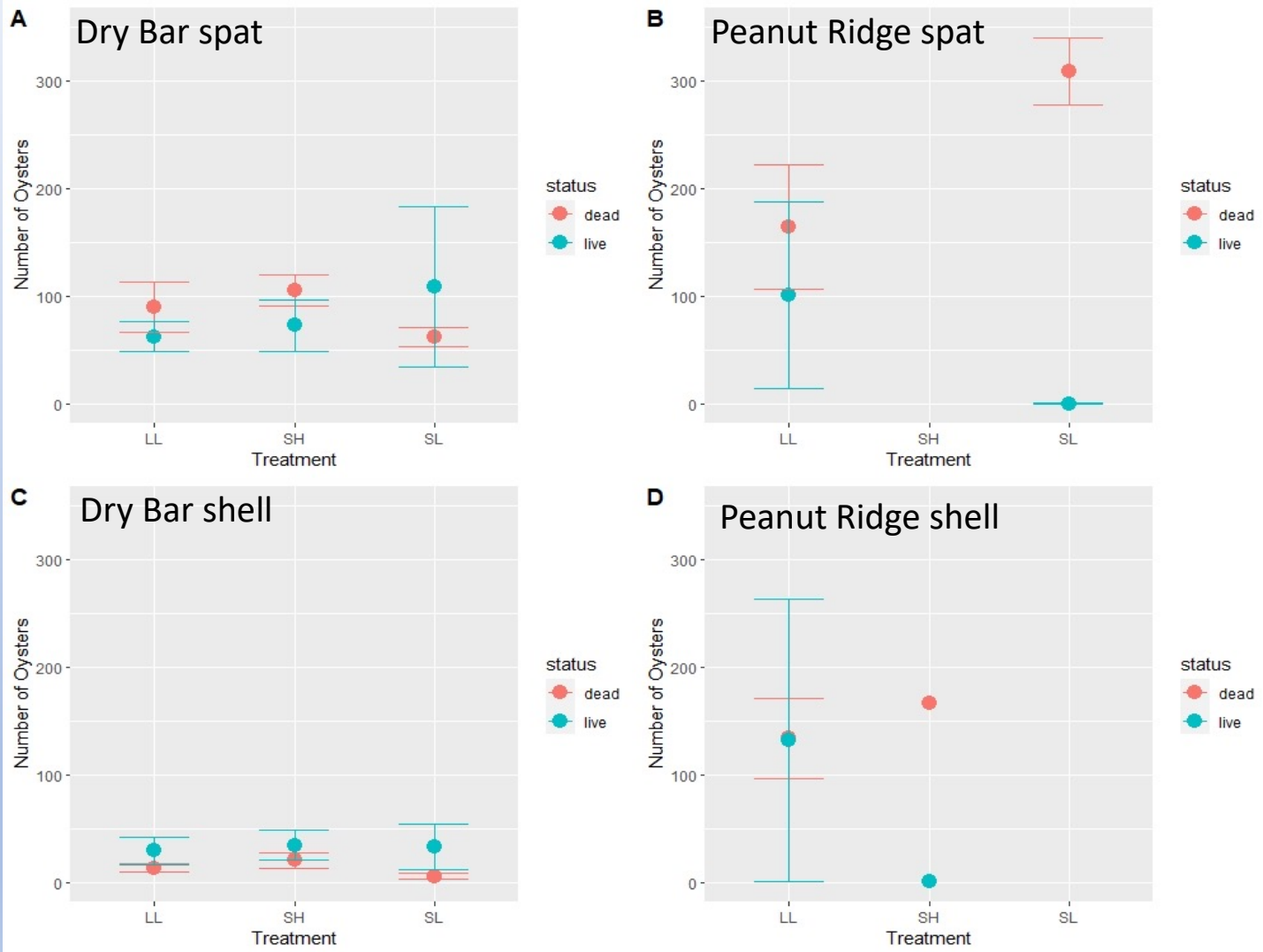
Document predators

Monitor environmental conditions

Cage 'door' for easy access



Results of spat survival from cage experiments



The image shows a close-up view of several mesh bags filled with oyster shells. The bags are made of a dark, fine-mesh material and are piled together. The shells are light-colored and appear to be oyster shells. The background is a dark, textured surface, possibly a rock or a pile of shells. The lighting is natural, highlighting the texture of the mesh and the shells.

Spat deployment

- Qualitative assessment of spat planting
- Place leftover spat on shell in biodegradable mesh bags (50 shells/bag)
- Place bags adjacent to restoration sites
- Monitor quarterly for 'success'

ABSI Permanent Hatchery

Algal stock cultures



Algal culture room



Spawning racks



Broodstock room



Larval tanks



Larval tanks



2022 hatchery operations

Spawned early May with Peanut Ridge broodstock

Most were females (> 2 inches)

Few males – very small (< 2 inches)

Male gonads infected with trematodes (*Bucephalus* sp) – parasitic flatworms

First spawn failed – water quality issues

Subsequent spawns failed due to broodstock condition, bacterial infections, and poor water quality.

Interns hired May 24th

- 2 FSU graduates – outside funding
- 4 OysterCorps students – ABSI funding
- Pilot project recycling farmed oyster shells

Hatchery stock enhancement summary

2021:

- Spawn and set relatively successful despite water quality problems. Two spawns produced and two sets of cages with spat-on-shell and bare shell controls placed on restoration reefs.
- Some cages were lost due to strong currents and insufficient securing methods, especially on Peanut Ridge. Results show significantly more spat on the seeded shell cages than unseeded at Dry Bar, so some limited success.
- Spat-on-shell in mesh bags were lost, torn or buried on Peanut Ridge and Dry Bar.

2022:

- Spawns failed due to poor water quality, poor broodstock quality, parasites in males and extreme temperature fluctuations in the new hatchery.

2023:

- Water quality issues resolved in hatchery. Use of probiotics help bacterial levels. Early spawning will be attempted to repeat spat-on-shell experiment on 2021 and new 2023 experimental reefs. Cages secured with sand augers to avoid loss under high currents.
- Mesh bags will be placed on top of reefs rather than adjacent on unstable substrate

Challenge:

Show proof of concept and find funding to support hatchery operations after ABSI ends in 18 months

DWH restoration grants? State funding? NOAA? Others?