EFFECTS OF CO-CULTURE OF URCHINS, *LYTECHINUS VARIEGATUS*, WITH EASTERN OYSTERS, *CRASSOSTREA VIRGINICA*

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INTEREST IN URCHINS AS AN AQUACULTURE SPECIES

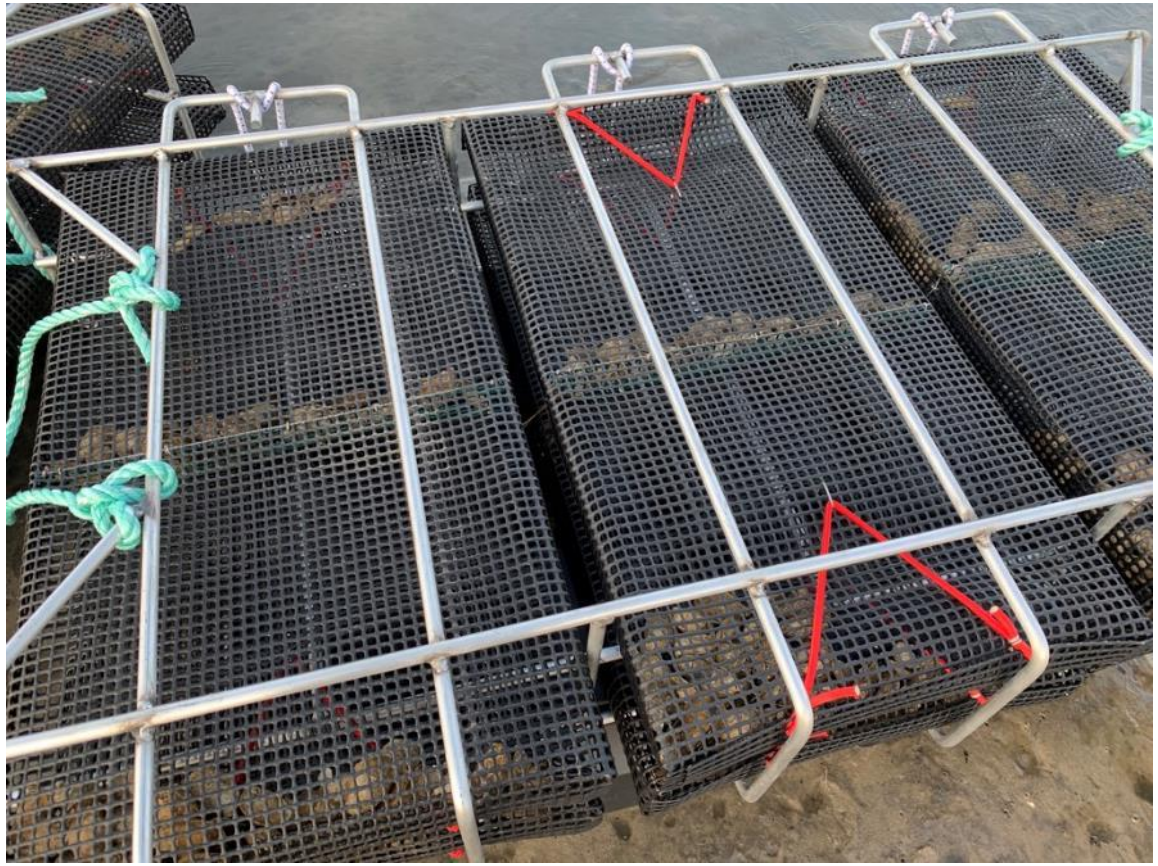
- Green sea urchin, *Lytechinus variegatus*
- Can be cultured in hatchery
- Harvested for roe (uni)
- Like high salinity (above 25 psu)
- Do not tolerate desiccation

CAN URCHINS BE RAISED IN CULTURE WITH OYSTERS?

- Can urchins be raised as a crop on its own?
  - —Food or other markets?
- Does culturing urchins with oysters have any significant effects upon the oysters?
- One year of funding from Gulf States Marine Fisheries Commission, 2019-20

EXPERIMENTAL DESIGN

- Two commercial oyster farms (floating cages): Alligator Harbor (AH) & Oyster Bay (OB)
- Urchins (collected from St. Joseph's Bay, test diameter ~25-35 mm) were deployed in October 2019 in clean 9 mm mesh bags with ~40 oysters (48 mm shell height)
- Three urchin stocking densities (n=16/site): 0, 4 or 8 urchins.
- As a control, urchins were also deployed without oysters at three stocking densities (n=4/site): 2, 4 or 8 urchins



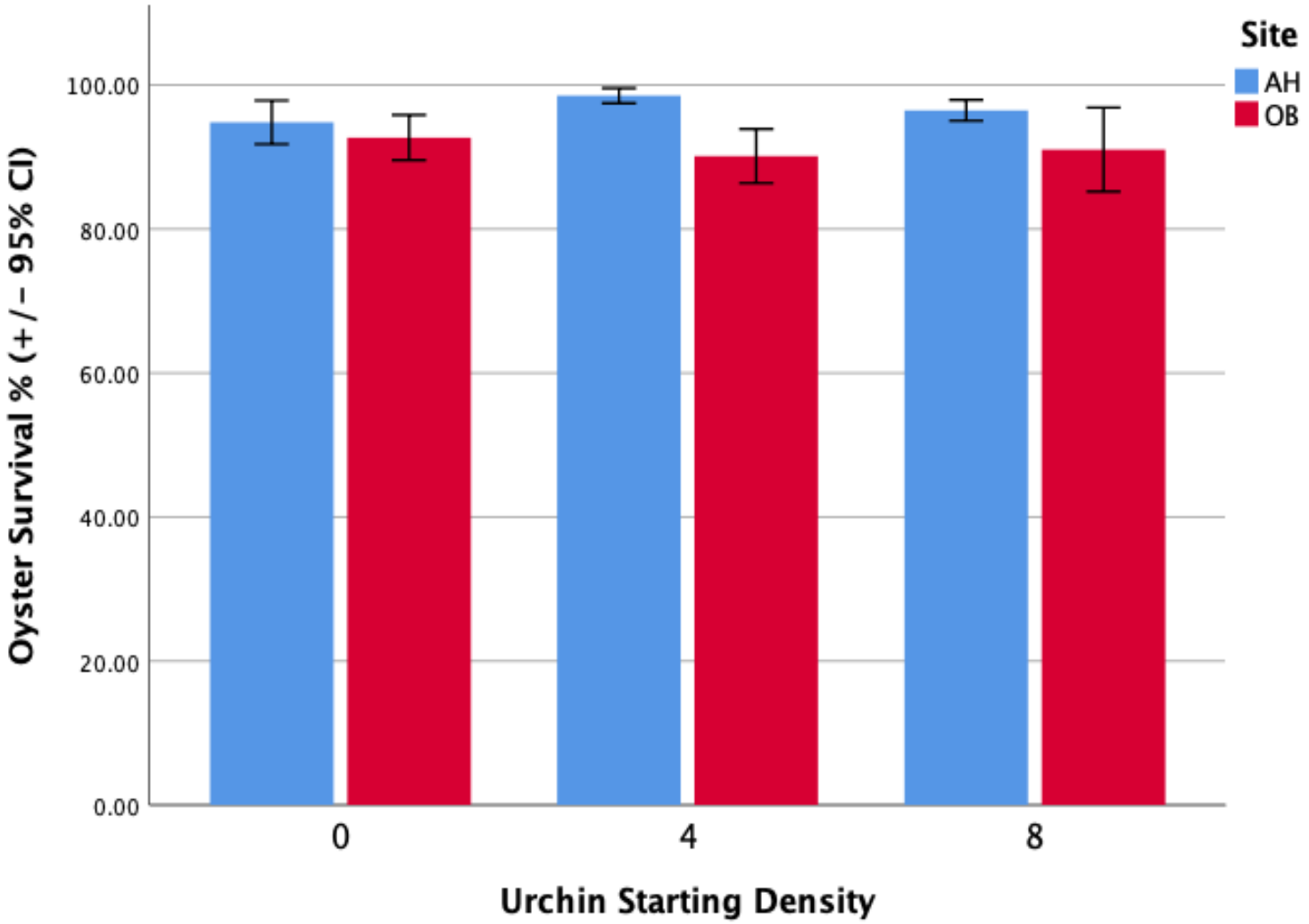
WHAT DID WE MEASURE?

- March 2020 (after 5 months)
  - —Urchin Performance
  - —Oyster Performance
  - —Biofouling on the Bags

OYSTER PERFORMANCE: SURVIVAL

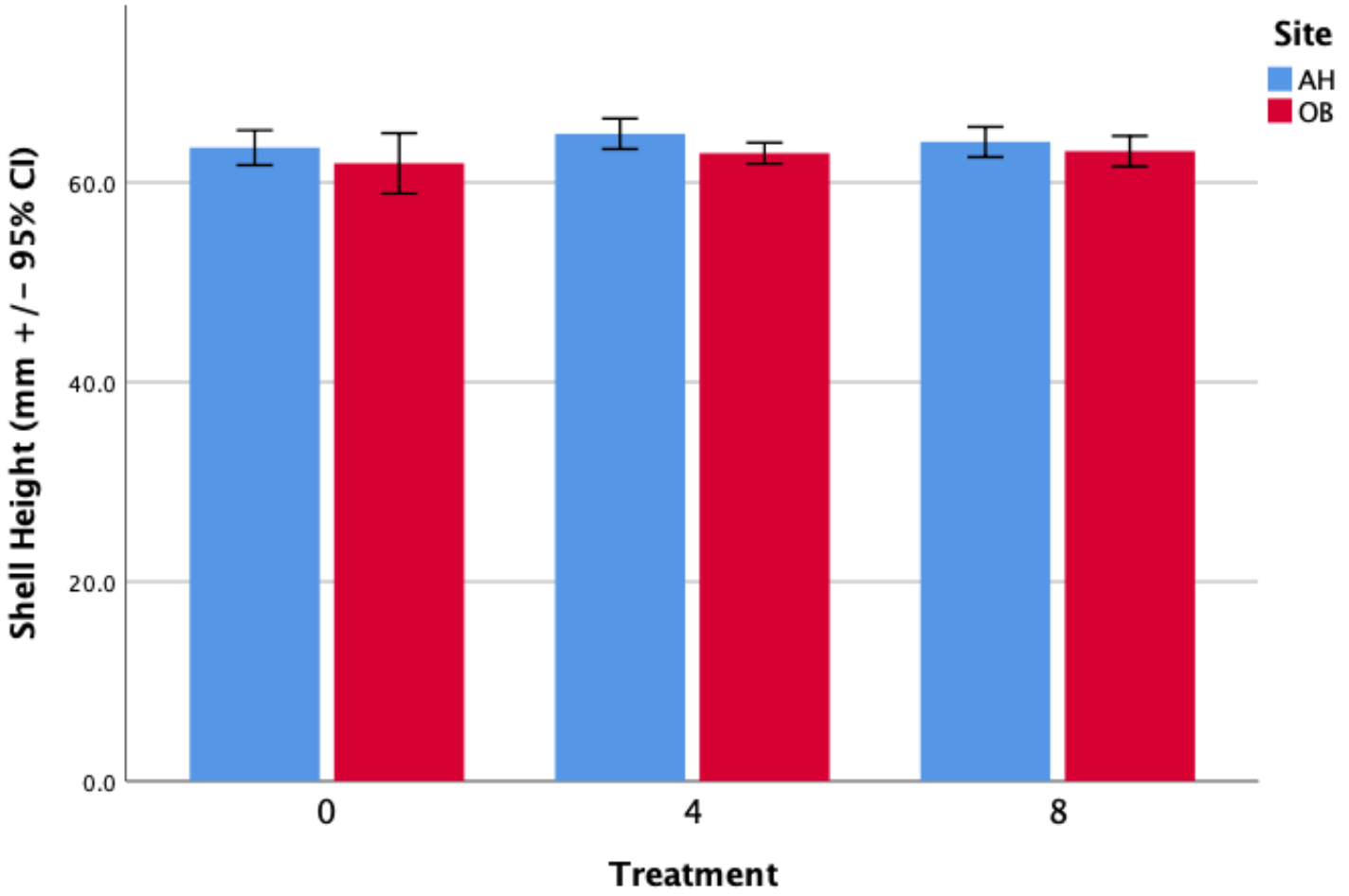
Urchins did <u>not</u> affect Oyster Survival

- Site Effect: AH > OB
- Site x Urchin Stocking Density was not significant



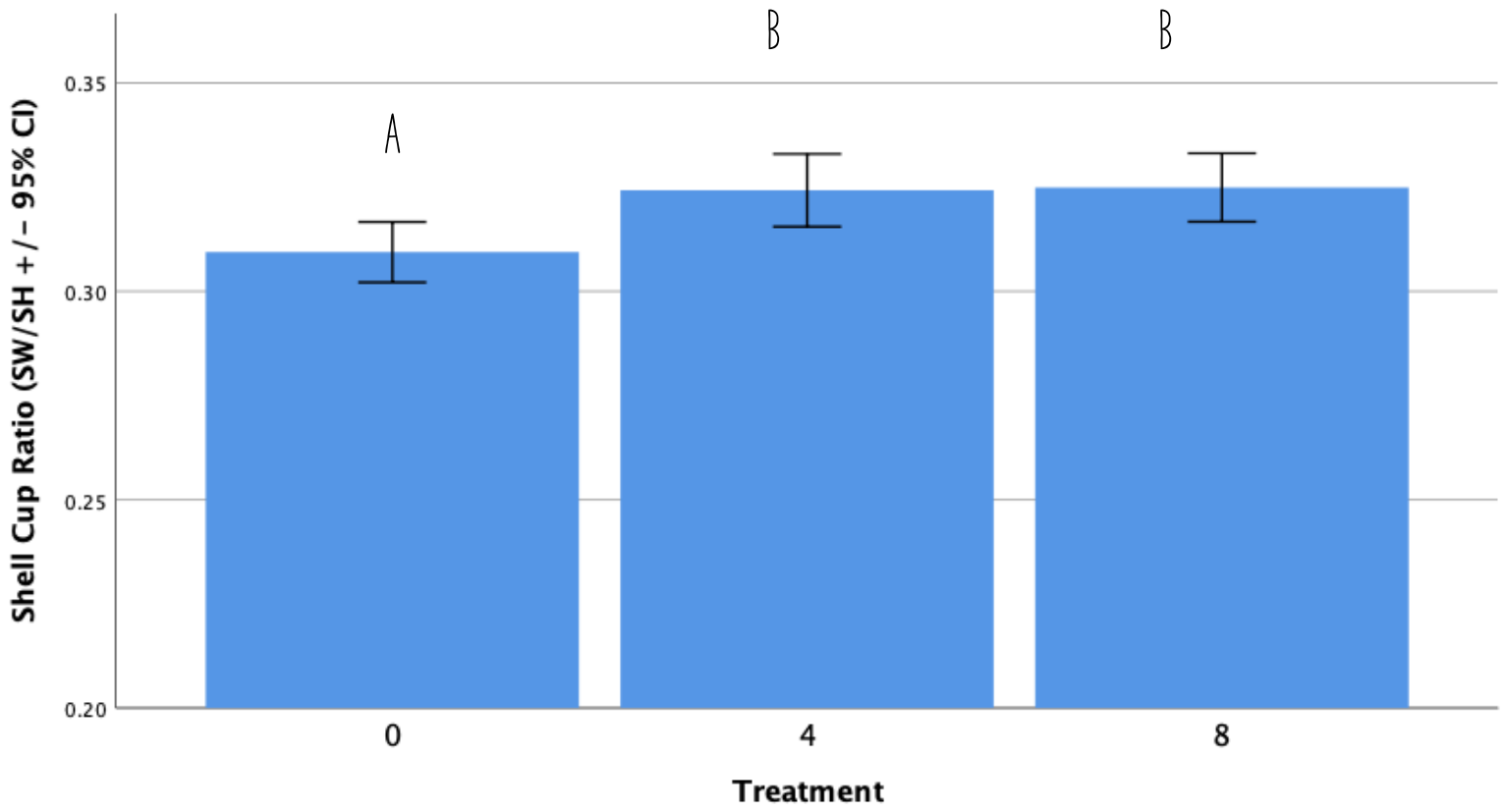
OYSTER PERFORMANCE: URCHINS HAD NO EFFECT ON SOME OYSTER GROWTH METRICS

- Urchins did not affect shell height
- Urchins did not affect shell length (not shown)
- Urchins did not affect the ‘fan’ (SL/SH) ratio



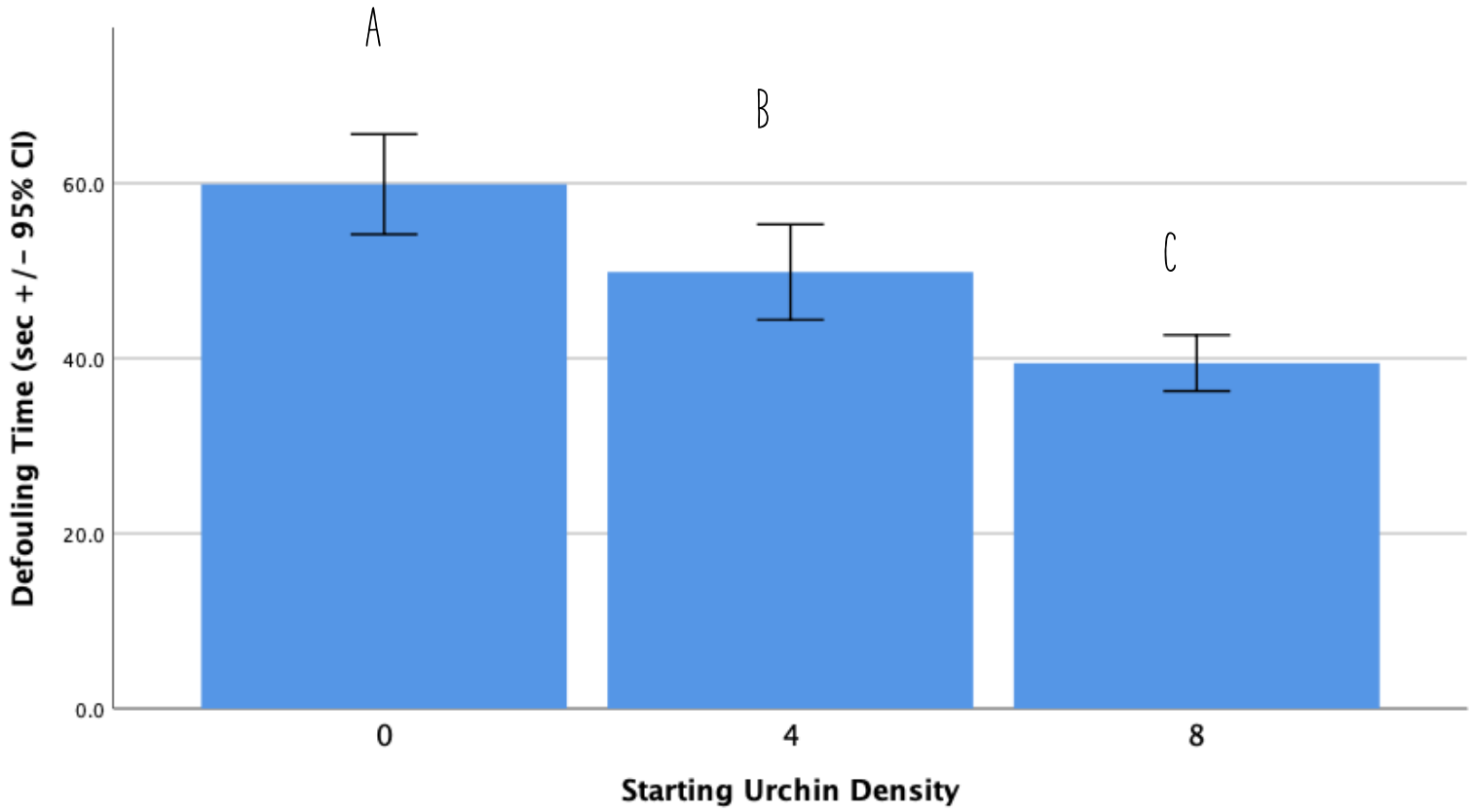
OYSTER PERFORMANCE: URCHINS IMPROVED SOME OTHER OYSTER METRICS

- Urchins produced oysters with deeper cups (0<4,8)
- Urchins produced oysters with heavier shells (0<4,8) (not shown)
- Urchins produced oysters with greater dry tissue weight (0<4,8) (not shown)



URCHINS REDUCED BIOFOULING ON OYSTERS

Oyster cleaning time decreased with increasing urchins (0>4>8)



BIOFOULING ON BAGS

- There was a significant urchin density by site interaction:
  - Urchins had no effect on the biofouling in OB, but significantly reduced bag biofouling in AH

NEXT STEPS?

REEVALUATING CO-CULTURE OF EASTERN OYSTERS WITH SEA URCHINS USING HATCHERY-PRODUCED JUVENILES

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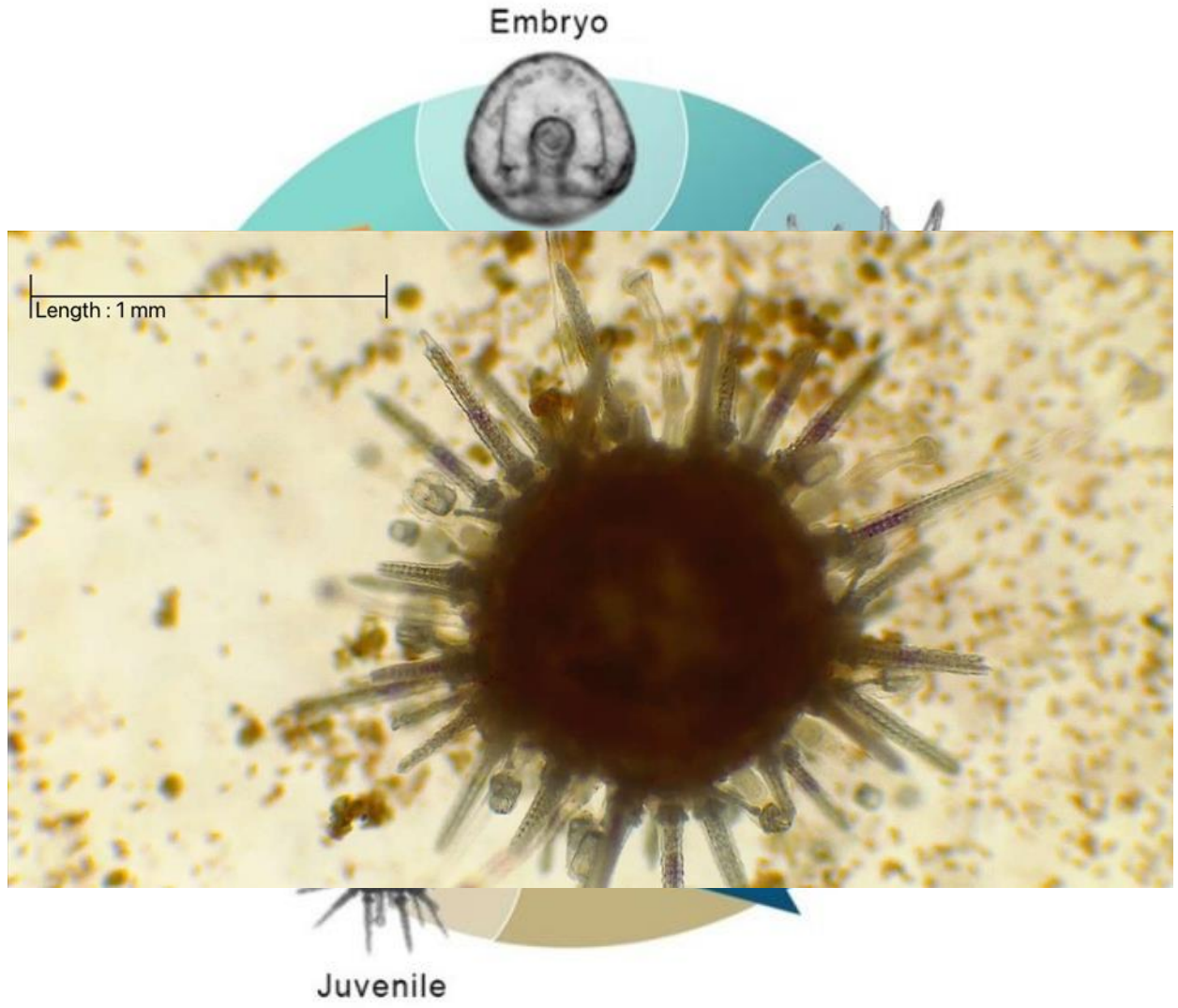
ASSESS POTENTIAL FOR COMMERCIAL DEVELOPMENT OF CULTURING HATCHERY-PRODUCED URCHINS WITH OYSTERS

1) Document hatchery production of green sea urchins
2) Assess
   a) performance of oysters cultured with and without hatchery-produced urchins in the field nursery and growout stages
   b) biofouling on oysters and culture gear in bags stocked with and without urchins
3) Determine methods of rearing juvenile urchins in an open-water environment using oyster culture gear

Funding from Gulf States Marine Fisheries Commission, Marine Aquaculture Pilot Project, 2022-23

HATCHERY PRODUCTION OF GREEN SEA URCHINS

- Broodstock of *Lytechinus variegatus carolinus* were collected from St. Joseph Bay, FL
- Closed-system hatchery laboratory located at the University of Alabama-Birmingham
- Juveniles will be transported to oyster farms at 7-10 mm test diameter



EXPERIMENTAL DESIGN

- In July, stock 1200 FL triploids (R6) in 4 mm floating bags (n=3) at 3 culture sites: Alligator Harbor (AH), Oyster Bay (OB), Cedar Key (CK)
- Also stock each bag with 24 (7-10 mm test) juvenile urchins
- After 1-2 months, restock at 200 oysters and 12-16 urchins per 9 mm bag (n=4)
- No biofouling methods employed
- As a control, same number of oysters cultured without urchins but with biofouling control

WHAT WILL WE MEASURE?

- Survival, shell and test metrics, and weight at end of nursery and growout stages
- Oyster condition and urchin gonad indices at end of study
- Amount of biofouling on oyster shells and bags both qualitatively and quantitively
- Cost savings in labor by reducing biofouling control efforts

FIELD NURSING JUVENILE URCHINS

- Hatchery-produced urchins stocked in 4 mm bags at 100-200/bag and reared for 6-8 weeks to ~12 mm (1/2"), size that can be placed in 9mm bags for biofouling control
- Treatments will consist of
  - Using nursery bags placed on farm one month prior to stocking to allow for growth of fouling organisms
  - Addition of macroalgae and seagrasses collected from where they naturally accumulate
- Urchins will be distributed to interested oyster growers at various farm sites in return for their observations

WHAT DO WE NEED?

- Industry partner at Oyster Bay and Alligator Harbor AUZs to conduct field nursery and growout replicate trials on their farms
- Allow access to experimental bags on farms for monthly sampling during field nursery and growout, and harvest
- Additional growers at various locations to observe performance of field-nursed urchins on oyster growth, survival, and biofouling communities