Collaborative research project at GTM NERR:

Stakeholder-driven modeling investigation of factors affecting oyster population sustainability

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Oregon State University Coastal Oregon Marine Experiment Station





Project Team

Project Lead: Dr. Will White (Oregon State University)

• Lead oyster population model development and analysis



Co-Investigator: Dr. David Kimbro (Northeastern University)

• Lead fieldwork in GTMNERR



Collaborative Lead: Kaitlyn Dietz (GTMNERR)

• Implement model analyses

Postdoctoral Scholar: Dr. Laura Storch (Oregon State)

• Coordinate workshops and outreach materials



End Users:

- Dr. Nikki Dix (GTMNERR)
- •Include project results in GTMNERR oyster monitoring program



Oyster Water Quality Task Force

• Contribute to study design and utilize results in oyster monitoring and restoration planning







Approach

- Size-structured oyster population model
- Model parameters based on field data estimates



- Growth and natural mortality rates at 9 sites throughout GTMNERR
- Oyster spat growing in cages since 2018
- Oyster spat monitored in cages (no predators) or outside cages (exposed to predators) since May 2019
- Extracting information on growth, size-structure, and recruitment from existing data & new surveys/outplant experiments

• Environmental data (salinity, chlorophyll, etc.) at each site

Field Data



Results: Growth differs **greatly** among sites







Results: Survival differs **greatly** among sites



Time (d)

Oyster clusters in cage experiment, started May 2019



Results: *Predation differs among sites*



150

100

Time (d)

0

50

200

Oyster clusters in cage experiment, started May 2019



Results: Mortality decreases with age



First ~100 d (late May to August)

Additional 100 d (late May to Nov)













2019-01

2019-07

Matanzas

40

30

20

10

0

2018-07

Butler



Pellicer









2019-01

2019-07

Continuous data logger at each site





Continuous data logger at each site





Salt

2018

2019



HydroCAT multi-sensor deployed during monthly surveys



Do environmental factors explain mortality patterns?



Correlations between mortality and environmental factors – summer 2019



Do environmental factors explain mortality?

1.0

0.5

0.0

-0.5

-1.0



Correlations between mortality and environmental factors summer 2019



Do environmental factors explain growth?



Correlations between growth (maximum size) and environmental factors – summer/fall 2018



Do environmental factors explain growth?



Correlations between growth (maximum size) and environmental factors – summer/fall 2018



Model Analysis

• Size-structured integral projection model

• Estimate eggs-perrecruit at sites throughout GTMNERR. *How many eggs will the average spat produce in its lifetime?*

 Proxy for population sustainability when larval transport patterns are uncertain



Example model fits from Apalachicola

Model results: Per-recruit productivity greatest near inlet



St. Augustine





Pellicer

Relative abundance



Guana







Matanzas





Model results: Per-recruit productivity greatest near inlet





Ongoing work...

National Science Foundation project:

- Importance of predator 'cues' vs. actual predation
- Continued monitoring & experimentation

Model analysis:

- Model is publicly available, can accommodate future revised estimates of mortality, growth, etc.
- Fitting model to time series of field data for comparison to outplants?



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