Stakeholder-driven modeling to understand oyster population sustainability

J. Wilson White¹, Laura Storch¹, Nicole E. Peckham², Kaitlyn Dietz³, David L. Kimbro², Nikki Dix³
¹Oregon State University ²Northeastern University ³Guana Tolomato Matanzas NERR

The Problem
- Eastern oyster (Crassostrea virginica) harvest acreage in Guana Tolomato Matanzas NERR reduced by ~70% since 1985. Heavy harvesting pressure on remaining harvest areas?
- Predatory crown conch (Melongena corona), now common in parts of GTMNERR due to changes in estuary salinity
- Stakeholder concerns: How is oyster population sustainability affected by interaction of environmental factors (e.g., salinity, crown conch) and harvest?

Project Approach
- Field data
  - Cage/no-cage outplants of oyster spat in each GTMNERR region in 2018-2019. Measure growth, survival, predation
- Population model
  - Size-structured integral projection model (White et al. 2016, Kimbro et al. 2019)
  - Parameters for each GTMNERR region from field data
- Estimate eggs-per-recruit (EPR) in each GTMNERR region
  - Proxy for population sustainability when larval transport patterns are uncertain
  - High EPR = high restoration potential

Model results

Study location
Guana Tolomato Matanzas NERR

Outcomes
- Spatial gradients in growth and mortality lead to large differences in egg production & contribution to sustainability
- Zones near inlet are most productive
- Advice to managers & stakeholders on restoration potential
- Work still underway – see right-hand panel

Field experiment results
- Growth: Oyster clusters outplanted July 2018
- Survival (with and without predators)
- More to come
  - Add predator density + environmental variables as covariates
  - Full population model to examine best harvesting practices
  - R package for future use by GTMNERR staff

More information at this link:

We combined field experiments and models to measure oyster sustainability. We found large variation within an estuary; this will guide management.