Implementing Oyster Restoration Monitoring Recommendations

Sustainable Fisheries Goal Implementation Team
December 2018 Biannual Meeting
December 17, 2018

- **H. Ward Slacum, Oyster Recovery Partnership**
- **Dr. Dong Liang, Research Assistant Professor, Chesapeake Biological Lab**
- **Dr. Mike Wilberg, Professor, Chesapeake Biological Lab**
- **Dr. Ken Paynter, Associate Professor, University of MD**
- **Dani Zaveta, Environmental Analyst, Versar, Inc.**

Evaluation Components

- Accuracy
  - Systematic or Stratified Random

- Precision
  - Sample Size
  - Estimator
    - Design based estimator (what's currently used)
    - Small area estimator (Fay Herriot estimator)

- Total cost = Overhead + Patent effort + Diver effort
  - Cost based on 2015 to 2017 monitoring effort

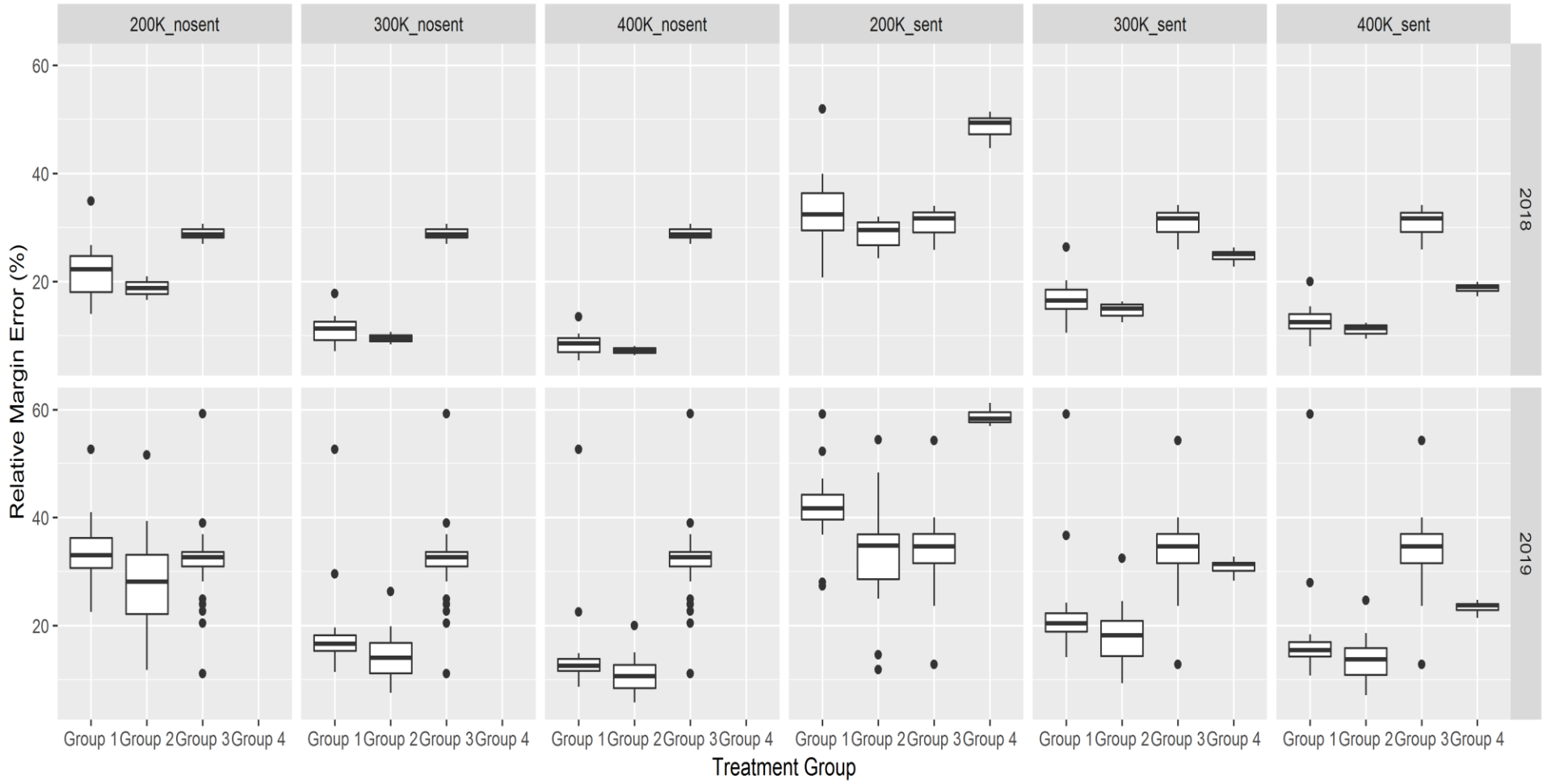
Evaluation Approach

- 2015 to 2017 monitoring data used to develop model
- Oyster density was used as the metric in the evaluation
- Range of costs for future monitoring- 200K, 300k, 400K
- Four reef groups
  - Seed only reefs (Patent tong)
  - Mixed shell (Patent tong)
  - Alternate substrate (Diver)
  - Sentinel/Reference sites were grouped together

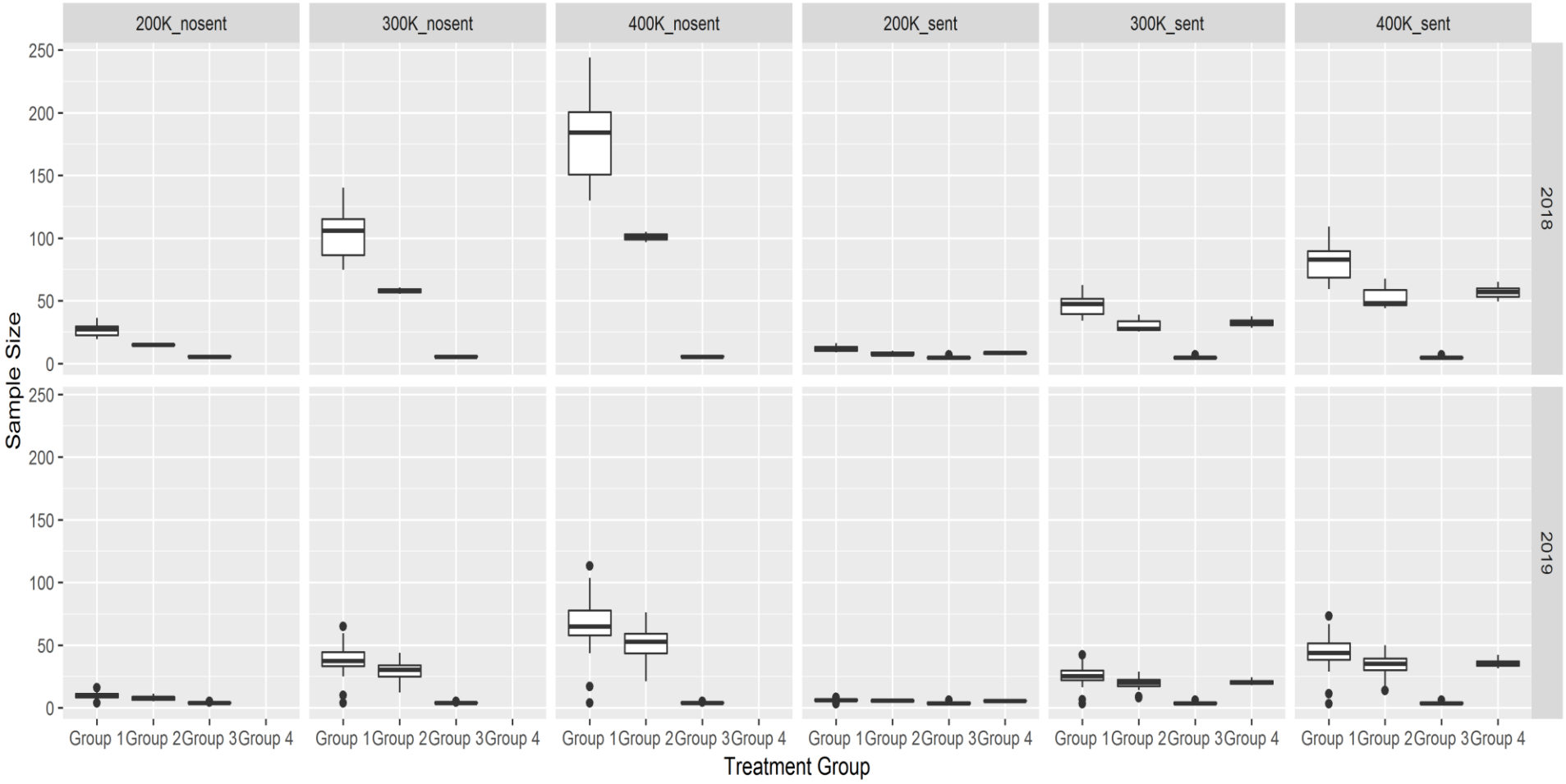
Evaluation Approach

- Evaluated 2018 and 2019 monitoring years
- Reef or cohort level
- Bootstrapping was used to conduct model runs
- Evaluated precision using Relative Margin of Error (%)
  - *Is the difference between the estimate and it's 95% confidence limit, expressed as a percent of the estimate.*
- * Capped diver samples at 175

Design Based Estimator Results



Reef Level Sample Size

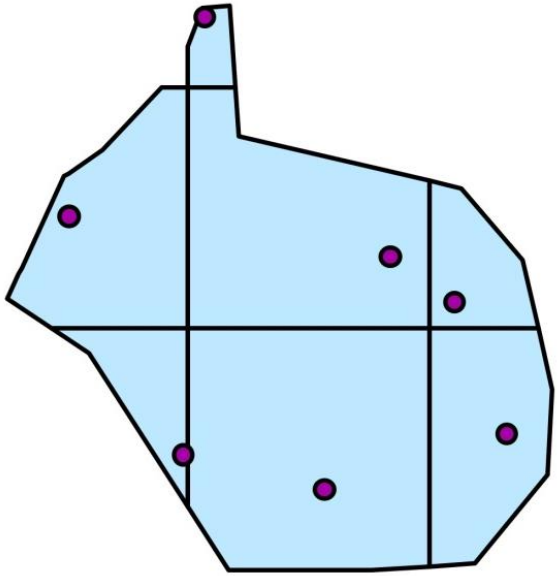


Summary

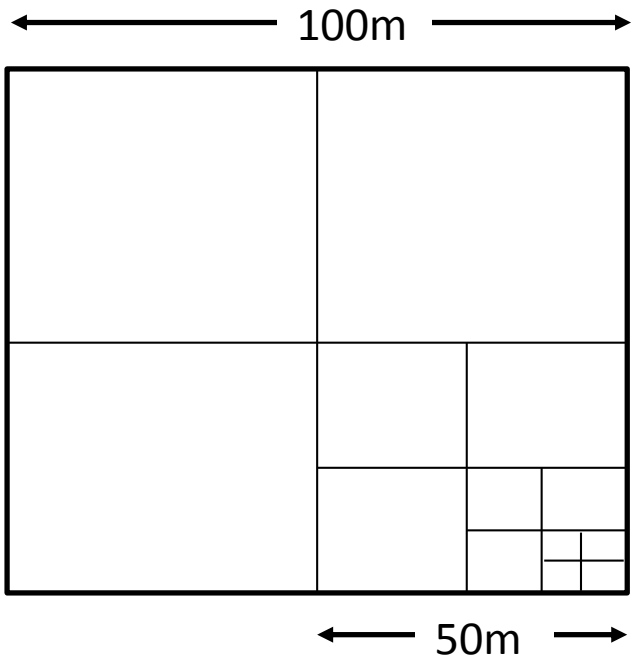
- Monitoring efforts at the budget levels evaluated attained sufficient sample sizes to provide acceptable RME for estimates of oyster density.
- Total sampling per gear type is potentially reduced by at least 30%.
- Recommend changing MD Monitoring and Assessment Program's 3 and 6 year monitoring from systematic to stratified random.
- Recommend monitoring remain at the reef level.
- Model results suggest 175 diver samples can provide sufficient precision at the reef scale and diver samples during 2018 monitoring can be capped at 175 to constrain effort.
- The model cannot be fully optimized when diver samples are capped.

2015 to 2017 Monitoring Design

- Systematic with random component

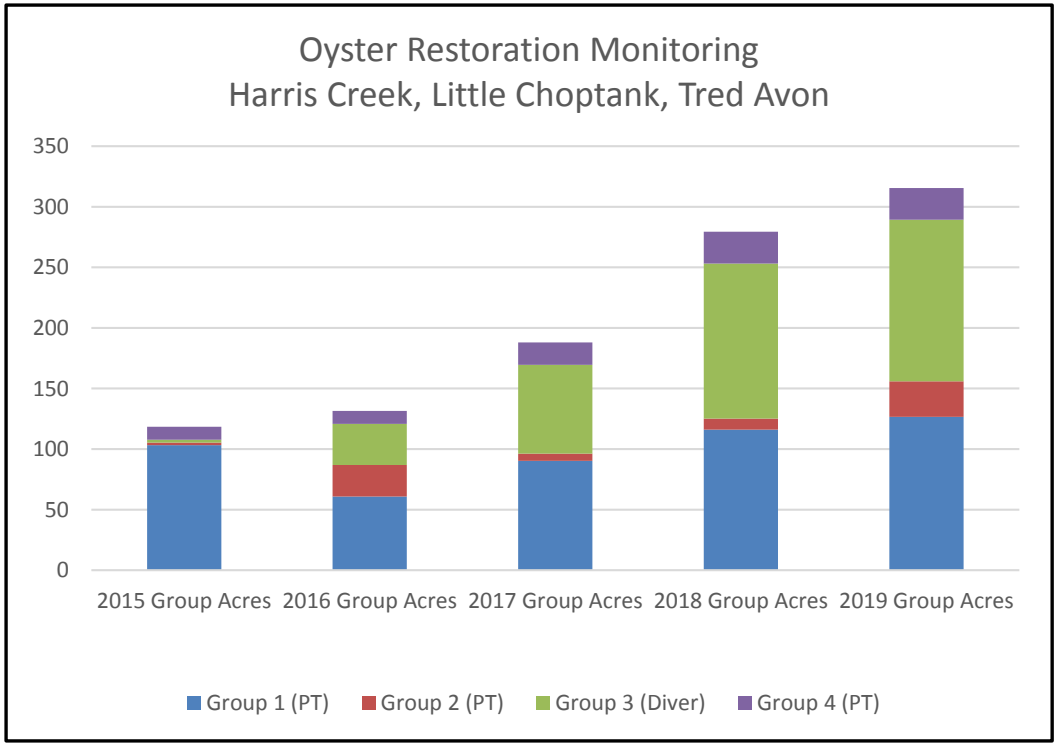


- Grid cell size increases with reef size
  - 12.5m
  - 25m
  - 50m
  - 100m



Future Monitoring Needs

- Funding
  - NOAA provides level funding
  - USACE provides funds to monitor reefs they construct



Number of Samples				
Gear	**2015**	**2016**	**2017**	**2018**
Patent Tong	464	266	270	469
Diver	9	91	110	243
Total	**473**	**357**	**380**	**712!**