2022 Cooperative Winter Atlantic Menhaden Survey

Geneviève Nesslage
UMCES Chesapeake Biological Laboratory

ASMFC Atlantic Menhaden Board Meeting
April 30, 2024

Collaborators

Academic/Private Scientists

- Genny Nesslage, Dong Liang - **UMCES CBL**
- Jim Gartland, Rob Latour, Dustin Gregg, Jameson Gregg, Charlie Jordan, Matt Farnham, Chris Bonzek - **VIMS**
- Chris Gurshin - **Normandeau Associates**

Industry collaborators

- Jeff Kaelin, Wayne Reichle - **Lund's Fisheries**
- Stefan and Leif Axelsson - **Captains F/V Dyrsten**

Federal & State Partners

- Michael Jech - **NEFSC**
- Jeffrey Brust, Jamie Darrow - **NJDEP**
- Ray Mroch, Amanda Rezek - **SEFSC Beaufort**

- Special thanks: **Delaware, North Carolina, and South Carolina** for transfer quota to support survey

Goals & objectives

Saltonstall-Kennedy Priority #2: *Science/technology that promotes sustainable U.S. seafood production and harvesting*

Goal: Conduct acoustic survey of overwintering Atlantic menhaden offshore of New Jersey to support sustainable development of winter bait fishery

Objectives

1. Estimate overwintering menhaden biomass and age/size/sex/maturity of fish in study area
2. Evaluate performance of industry acoustics in cooperative research
3. Evaluate menhaden ageing uncertainty

Survey design

- Menhaden difficult to survey
  - Form large, dense, patchy schools
  - Not typically at surface during the day in winter
- Designed, simulated-tested, and published a novel approach (SCEMFIS-funded project)
  - Liang et al. 2020 Fisheries Research
- Technical Committee review (memo 8/10/2020)

Fisheries Research 222 (2020) 105402

Contents lists available at ScienceDirect

Fisheries Research

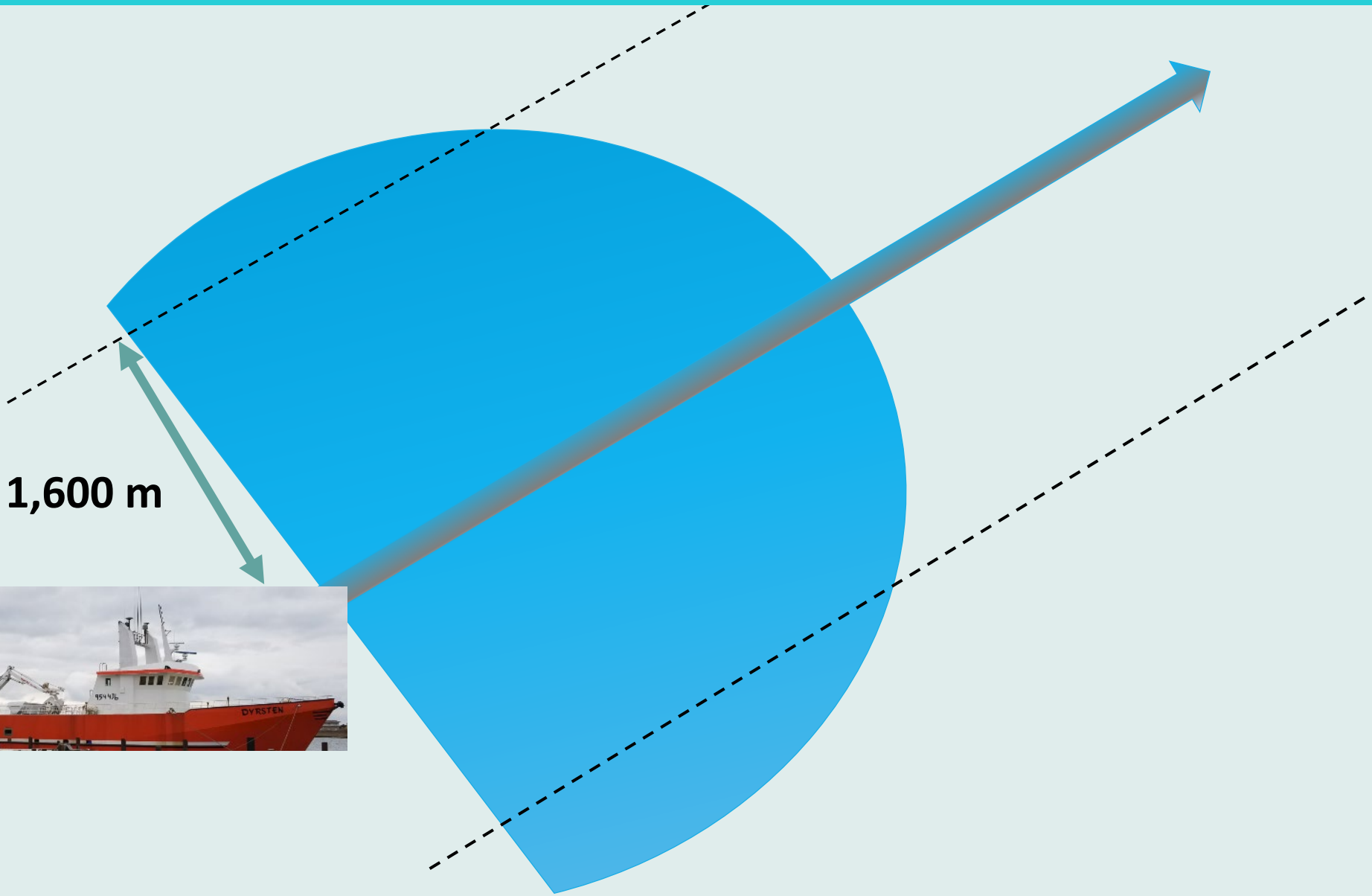
journal homepage: www.elsevier.com/locate/fishres

A spatial simulation approach to hydroacoustic survey design: A case study for Atlantic menhaden

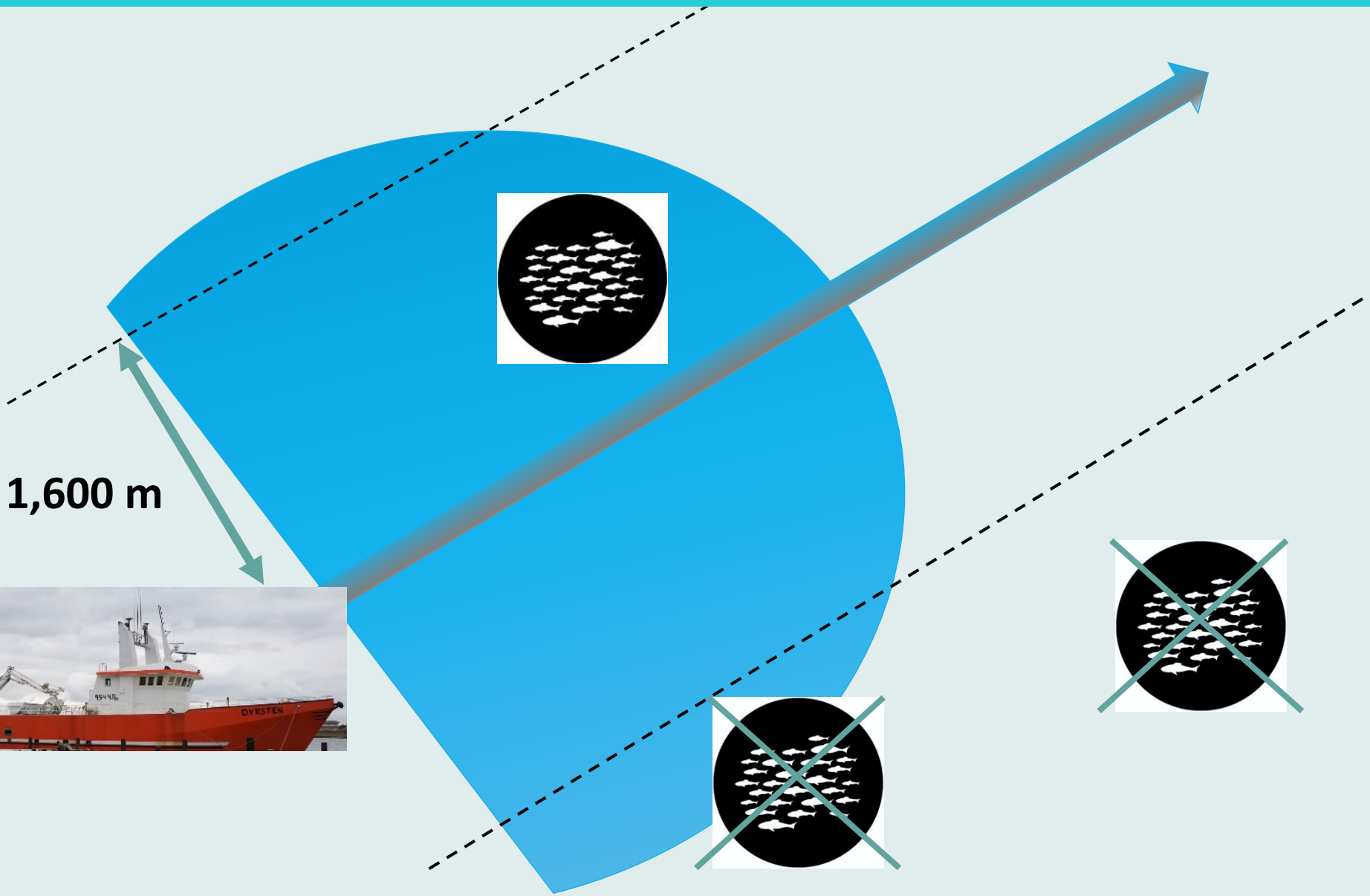
Dong Liang*, Geneviève M Nesslage, Michael J Wilberg

University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory

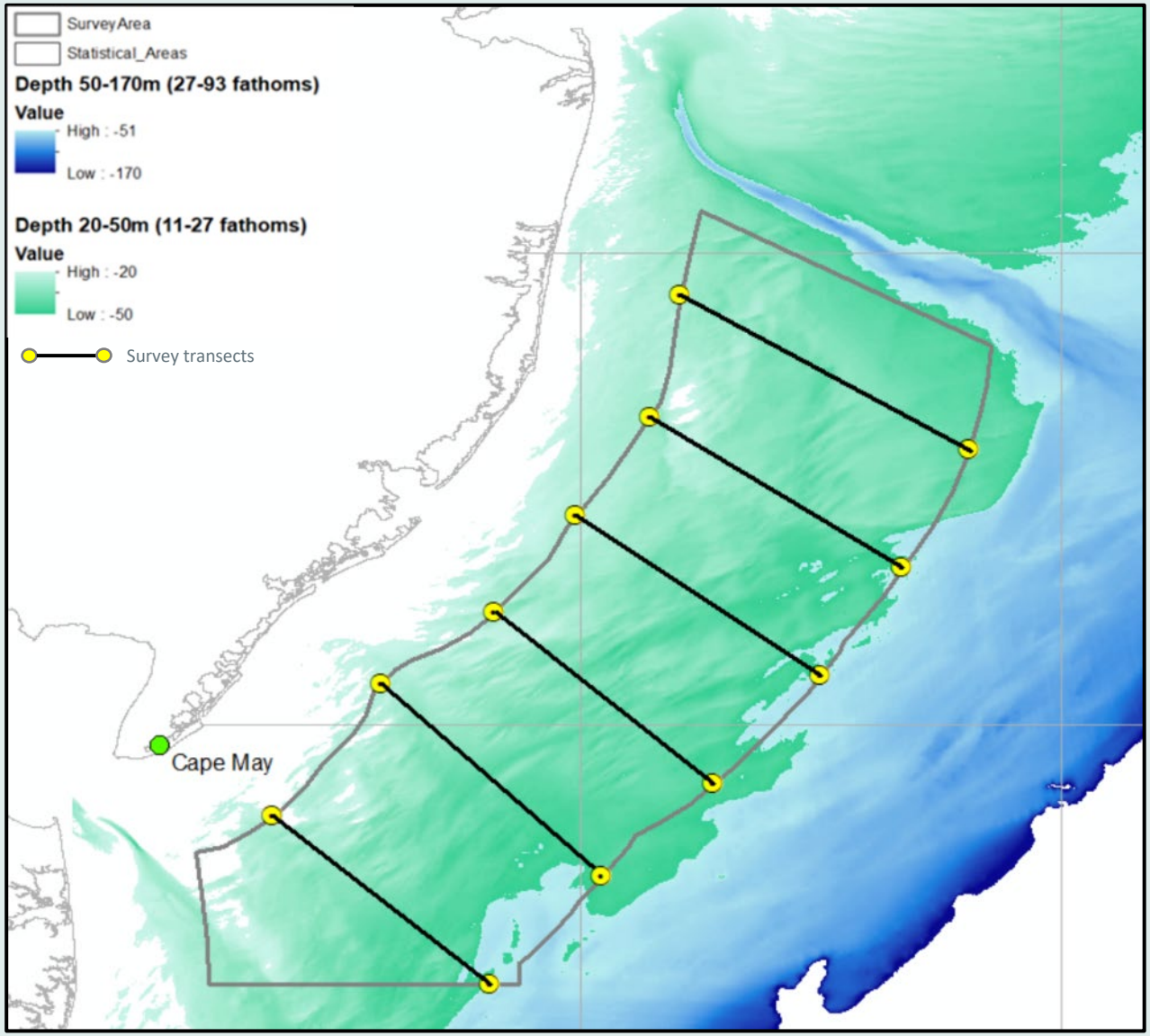
Survey design



Survey design



Study area


Survey Area
Statistical_Areas
Depth 50-170m (27-93 fathoms)
Value
High : -51
Low : -170
Depth 20-50m (11-27 fathoms)
Value
High : -20
Low : -50
Survey transects
Cape May

Methods

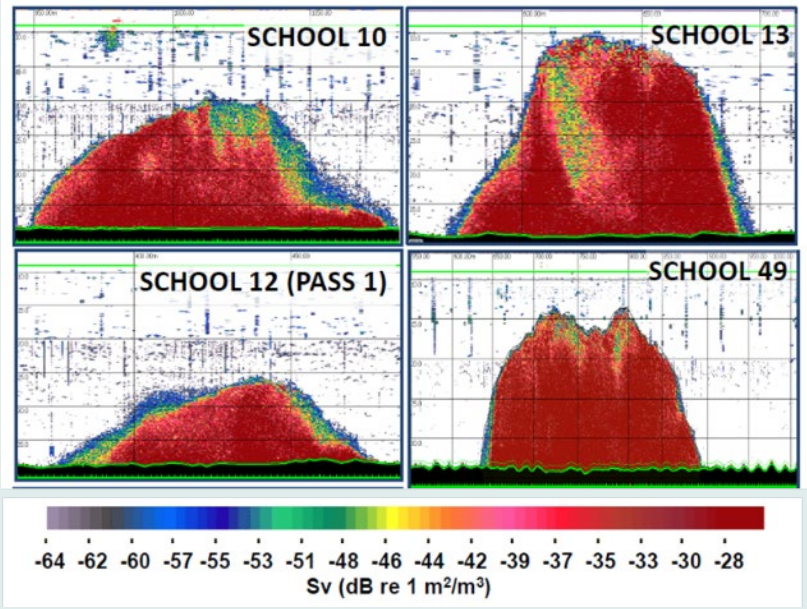
- *F/V Dyrsten* 160ft midwater trawling vessel
  - Experienced captains, VIMS survey crew
  - Vessel equipped with advanced industry-grade downsounder and omnidirectional sonar
  - Able to capture and store individual schools

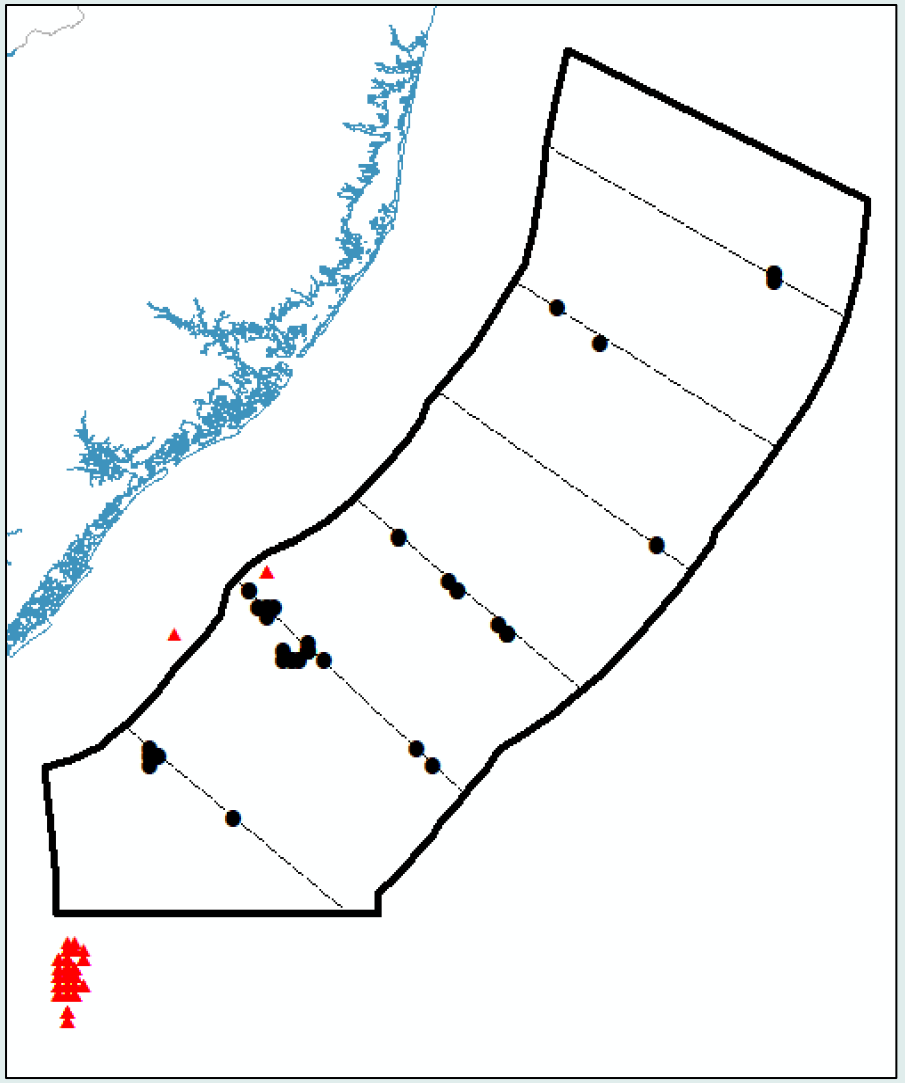
Implementation

- Echosounder calibration Feb 10-13, 2022
- Design-based survey conducted Feb 14-24, 2022
- Additional acoustic and sample data collection by VIMS crew during fishing operations Feb 28-Mar 4, 2022
- Additional port sampling Mar 4-22, 2022

Data collection summary

- 107 schools ensonified
- 5 schools sampled and weighed individually at port
- Temp/salinity/dissolved oxygen at 124 locations

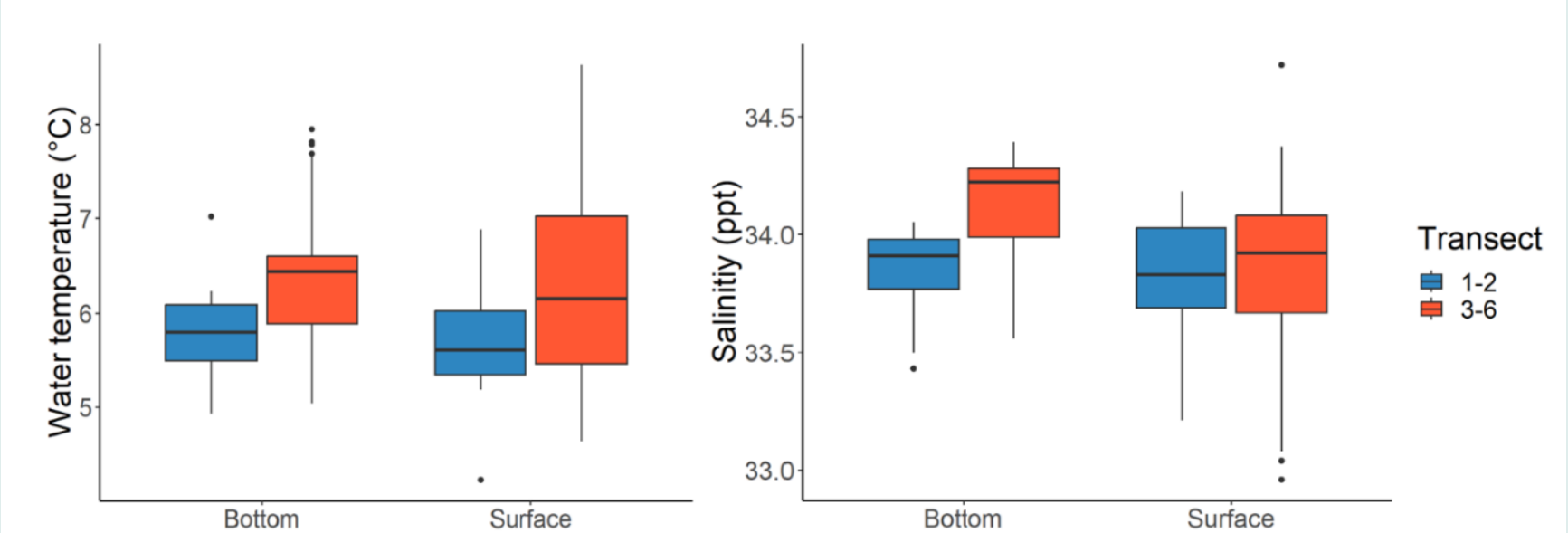




Black outline = survey area, dashed = transects, survey schools (black circles), post-survey schools (red triangles).

Data collection summary

- Warm eddy moved warm, saline water onto the shelf mid-survey, affecting transects 3-6
- Impacted schooling behavior and survey catchability

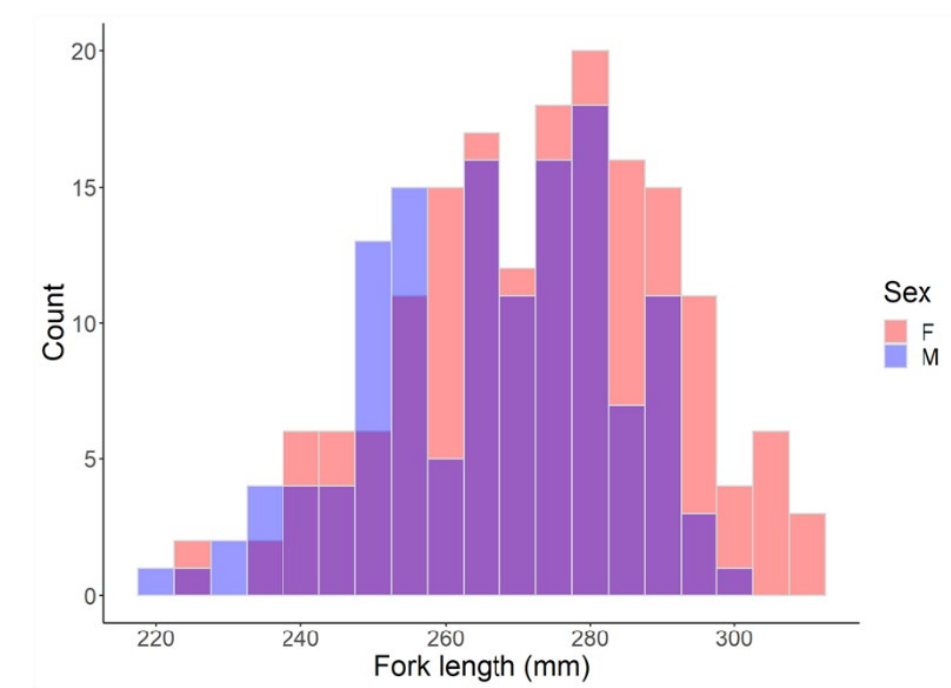


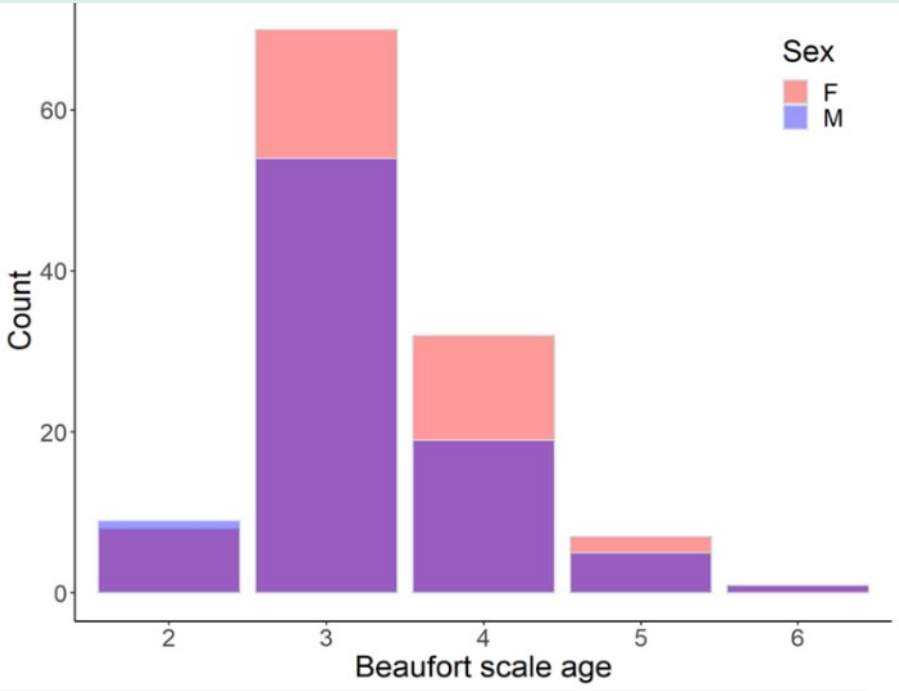
Data collection summary

- 4,399 size samples
  - Length, weight
- 303 full workups
  - Length, weight
  - Sex
  - Maturity stage (visual)
  - Age – paired scales and otoliths

Results

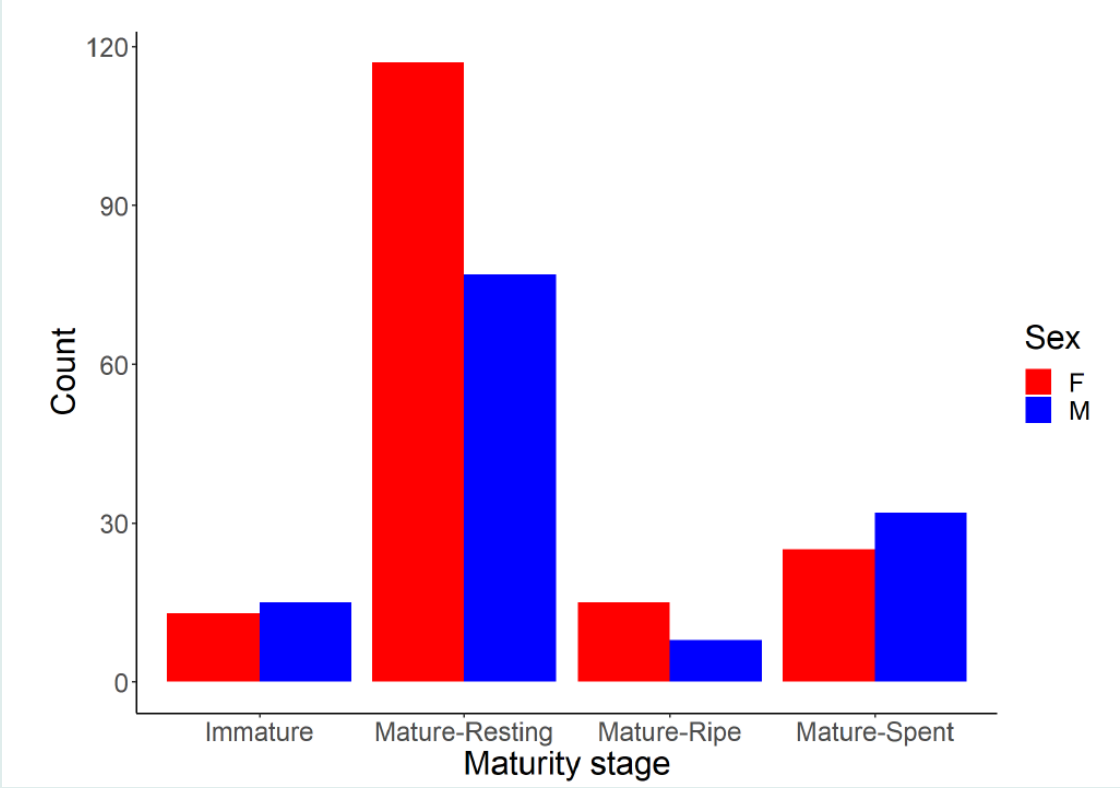
- Larger, older fish than typically encountered in port samples from reduction fishery
- Females larger than males
- Ageing differed among labs, but general agreement that most menhaden were ages 3-4





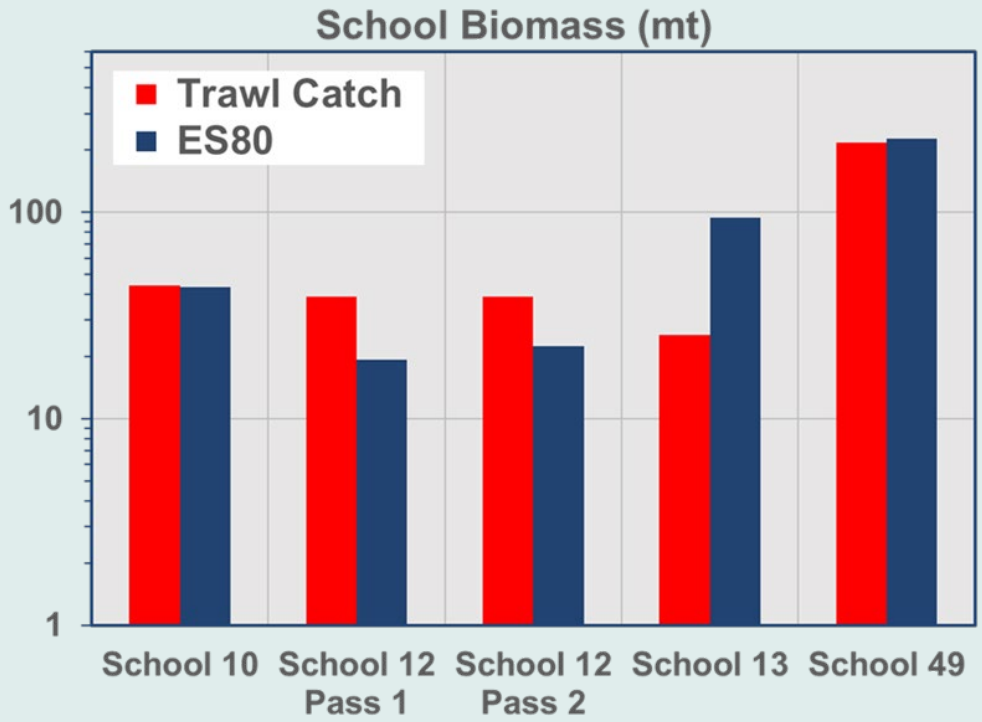
Results

- 56% female
- Most fish mature, but not currently spawning



Results

- Additional calibration and processing of commercial acoustic data required
- School biomass estimates similar to dockside weigh-outs



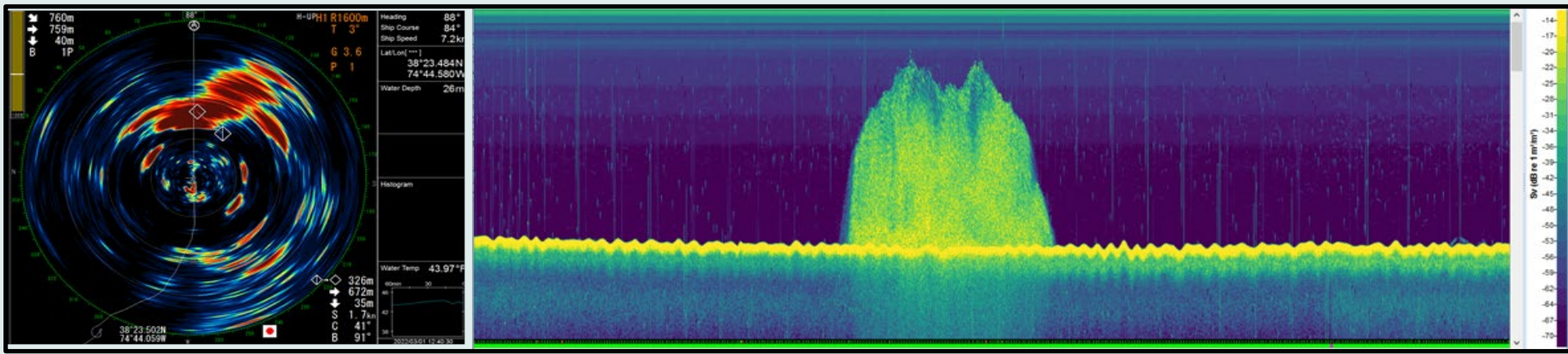
Results

- Total menhaden biomass in the study region estimated to be **7,963 mt (~17.5 million lbs) – 11,005 mt (~24 million lbs) in 2022**
  - Low estimate is conservative (assumes no effect of warm eddy)
  - High end reflects spatial model-based estimates that account for change in catchability with change in water temperature
- Study area biomass is ~0.22-0.31% of age 1+ coastwide biomass estimated for 2022
- NJ winter trawl quota equivalent to ~6-9% of study area biomass in 2022

	Metric tons	Pounds
Study area biomass estimate min	**7,963**	**17,556,115**
Study area biomass estimate max	**11,005**	**24,261,843**
Coastwide age 1+ biomass from 2022 assessment	3,594,979	7,925,562,603
Typical NJ winter trawl quota	~680	~1,500,000

Conclusions & Next Steps

- Fishery-independent confirmation of overwintering menhaden
- Small portion of population overwinters on the NJ shelf
- Estimated study area biomass in 2022 (7,963 mt) large compared to NJ winter trawl quota (~680 mt)
- Non-traditional acoustic survey design necessary for schooling pelagics such as menhaden
- Next steps:
  - Ageing team developing best practices recommendations
  - SCEMFIS-funded project to study menhaden size-at-age



Genny Nesslage
nesslage@umces.edu

Update on the 2025 ERP Benchmark Assessment & Menhaden Single-Species Update

April 30, 2024

K. Drew, ASMFC

Current Timeline

	Milestone	Date
✓	TC Call to review TORs and timeline	Oct. 4, 2022
✓	TC/ERP WG planning call	early Feb 2023
✓	Methods Scoping Workshop	June 2023
✓	New datasets submitted	Septmeber 1,2023
✓	Data & Methods Workshop	October 2-5, 2023
	2023 data submitted	February - August 2024
	Methods Workshop II	October 2024
	Assessment Workshop	February 2025
	TC call to approve reports	Week of July 14, 2025
	Peer Review Workshop	mid-late August 2025
	Assessments presented at Annual Meeting	October 2025

Data & Methods Workshop

- ERP WG met to review potential new data sources and discuss high priority model development tasks

- Meeting summary available online

Data & Methods Workshop

- Nesslage et al. survey was not considered for inclusion in the assessment, but weight-at-age data from that study showed some discrepancies with the weights used in the single-species assessment

→ ERP WG recommended the SAS explore the weight-at-age question in more depth using additional data sources as part of the assessment update

Data & Methods Workshop

- J. Ault presented a re-analysis of the tagging data used to develop estimates of menhaden *M* that resulted in a lower *M* when using a different subset of data and different methods

→ ERP WG recommended additional work be done to understand the differences between the datasets in question and conduct a sensitivity run with the lower *M* for consideration in the ERP models

Data & Methods Workshop

- B. Watts presented on the relationship between menhaden and osprey in the Chesapeake Bay and other nearshore piscivorous birds

- ERP WG reviewed additional literature on marine mammal diets

Data & Methods Workshop

- Marine mammal and bird diet and abundance data are still extremely limited coastwide

→ ERP WG recommended a comprehensive review of existing data to update the NWACS-Full model as a complement to the NWACS-MICE model but not include birds or marine mammals in the NWACS-MICE model at this time

Data & Methods Workshop

- ERP WG reviewed new diet information on bluefin tuna and blue catfish

→ Recommended exploring the inclusion of bluefin tuna further, but not blue catfish for this assessment, as the more comprehensive diet data studies indicated menhaden was a small component of the diet and the geographical overlap with menhaden was limited

Data & Methods Workshop

- High priority modeling tasks
  - Incorporate seasonal dynamics into the NWACS-MICE model to better capture predator-prey temporal overlaps
  - Incorporate bottom-up feedback into the VADER multispecies statistical catch-at-age model
  - Continue development and testing of the Wilberg et al. Age-Structured Predator-Prey (WASPP) simulation model to complement/support the NWACS-MICE and VADER models

Data & Methods Workshop

- High priority modeling tasks
  - D. Chagaris has been funded through an S-K grant to incorporate spatial dynamics into the NWACS-MICE model during this benchmark
  - ERP WG is gathering additional data and reworking existing multispecies data to support the finer seasonal and spatial scale for model development

Single-Species Update

- Fishery-independent data through 2023 submitted
- Fishery-dependent data due this month
- Plan to have base model runs completed in time for the Oct. 2024 Assessment Workshop

Single-Species Update

- SAS requested all available weight and age data from the states and received limited data to evaluate this issue for 2025 update

- SAS determined that changing *M* was not warranted at this time, but will conduct sensitivity runs with lower estimates and will look further into the discrepancies between the data sources for the *M* estimates

Spatial ERP Timeline

- NWACS-MICE will incorporate more information on seasonal and spatial dynamics into the ERPS for this benchmark

- BAM single-species model remains a coastwide model

Spatial ERP Timeline

- ERP WG Memo, April 2021

Attributes	Approach	Timeline
Coarse spatial scale, minimal additional data requirements	Coastwide BAM + coastwide NWACS-MICE + supplemental Bay Information	5-7 years
	Coarse spatial BAM + coastwide NWACS-MICE ERPs Coarse spatial BAM + coarse spatial NWACS-MICE ERPs	5-7 years
Fine spatial scale, significant additional data requirements	Detailed spatial BAM + detailed spatial ERPs	10+ years

Spatial ERP Timeline

- Board decision at the time was not to delay the 2025 assessment to pursue development of the spatial ERP options

Spatial ERP Timeline

→ While this assessment will result in more refined ERPs that better capture the spatial dynamics of menhaden and their key predators, it likely will not provide quantitative advice about the Bay cap

Management Timeline

- 2025 Annual Meeting
  - Presentation of ERP and single-species assessments
    - Reconsider target and threshold reference point definition
      - Changes to the reference points can be made through Board action or through Adaptive Management
  - Specifications

QUESTIONS