Assessing Striped Bass Nursery Habitat Suitability in Chesapeake Bay – Project Update

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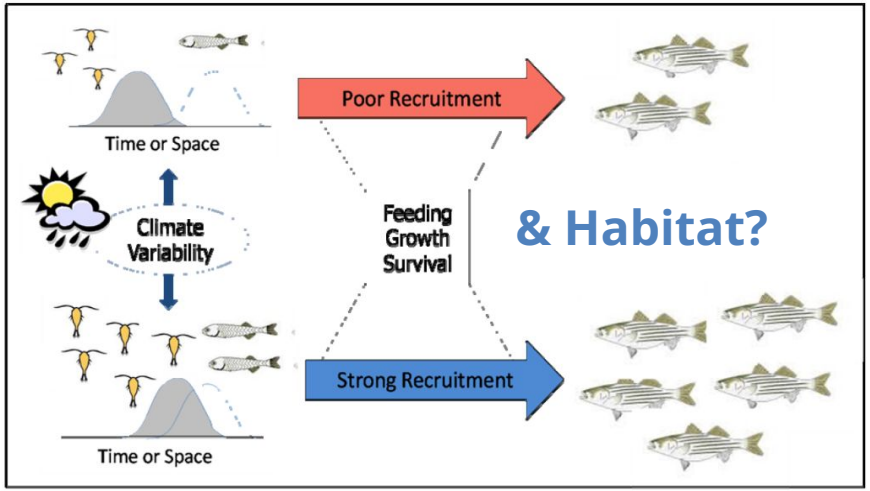
SFGIT Meeting
January 7, 2022

Motivation

- Overfished and overfishing occurring
  - Female SSB continues to decline despite recent years of avg. recruitment
- Recruitment is highly variable among years and nurseries in Chesapeake Bay
- Complex hydrological processes impact survival and growth of <u>larval</u> striped bass
  - Cooler spring temperatures and high levels of freshwater flow



Martino et al. ND - Disentangling causes of striped bass recruitment variability in Chesapeake Bay: forecasting year-class strength

- Conditions favored by <u>juvenile</u> fish - and the extent of suitable habitats - likely vary
- Long-term directional changes in estuarine habitat quality or availability

North and Houde 2001, 2003, North et al. 2005, Martino and Houde 2004, Martino 2008, Kerr et al. 2009, Martino and Houde 2010, Millette et

Importance of Research

"Rockfish show worrisome trends. The fish were well below sustainable levels in 2019, and there has been below-average spawning activity in the Bay over the past two years, highlighting the need for bold management actions to rebuild the population and [that] more effectively limit striped bass mortality and ***improve striped bass habitat****"*

- Chesapeake Bay Foundation 2020 "State of the Bay" Report

Photo credit: VIMS Juvenile Trawl Survey

- What conditions support the production of YOY (age-0) and resident sub-adult (ages 1-4) striped bass in Chesapeake Bay?
- Has the spatial extent of suitable habitat changed over time?

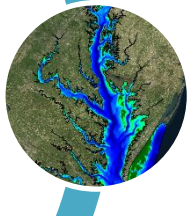
Habitat Suitability Model

Fishery-independent Surveys

- 5 surveys from MD and VA
- 1996-2019
- ~47,000 sampling events

Habitat Suitability Model

Fishery-independent Surveys



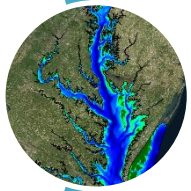
3-D Hydrodynamic model

- 5 surveys from MD and VA
- 1996-2019
- ~47,000 sampling events

- 30 possible habitat variables
- Static and dynamic (instantaneous and tidal-averaged) conditions

Habitat Suitability Model

Fishery-independent Surveys



3-D Hydrodynamic model

DO

Interpolated dissolved oxygen model

- 5 surveys from MD and VA
- 1996-2019
- ~47,000 sampling events

- 30 possible habitat variables
- Static and dynamic (instantaneous and tidal-averaged) conditions

- Bottom and surface DO
- DO stratification
- Monthly □ Daily

- Four datasets were used to characterize ‘suitable’ and ‘optimal’ habitats for YOY and resident fish up to age 4
  1. Age-0 – Seine; shoreline habitat ≤ 2 m
  2. Age-0 – Small trawl
  3. Age 1-4 – Small trawl
  4. Age 1-4 – Large trawl; mainstem

- What are the important factors driving relative abundance of striped bass in each of these datasets?

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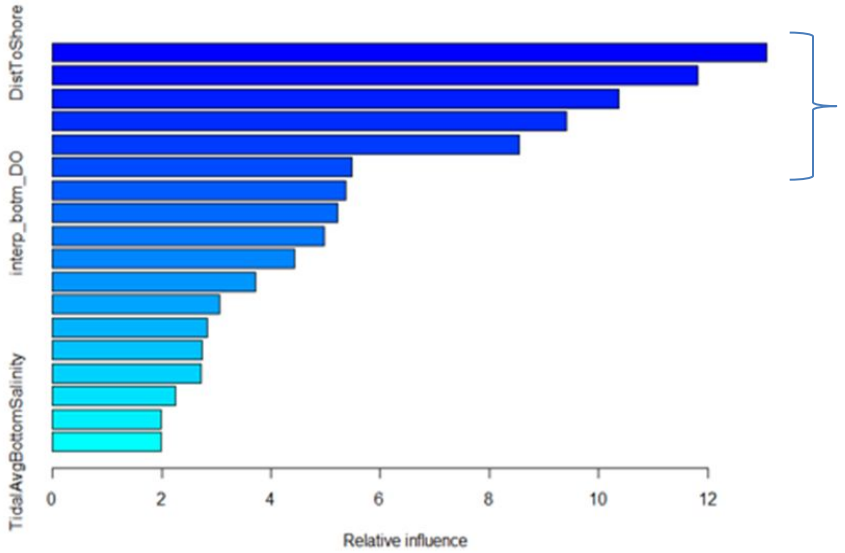
- What are the important factors driving relative abundance of striped bass in each of these datasets?

- Boosted regression trees (BRTs)
  - Variable selection through measures of relative influence



Key Findings (to date)

- Metrics of dissolved oxygen, salinity, and current speed consistently identified as influential variables for both age groups; water depth was influential for describing habitats for age 1-4 striped bass
- Different subsets (and numbers) of variables were selected for each dataset
  □ Environmental conditions and habitat features that describe suitable habitats differ between age groups
- Greater seasonal or interannual variability in suitable habitats (vs. spatial distribution)
  - Mgmt. Implications: Identify consistently high-quality habitats

Key Findings (to date) - Continued

- HSI maps are a useful tool for visualizing areas with the potential to support high abundances of striped bass
- 'Suitability' is a function of (1) variables selected, (2) survey design, and (3) availability of fish to gear
  - Spatial and temporal differences in the survey data and differential habitat use throughout ontogeny adds layers of complexity

Next Steps

- Is extent of suitable habitat an explanatory factor in the relative abundance of striped bass bay-wide over this time period?
- Next Step: Assess the relationship between extent of suitable habitats and abundance of age-0 and age 1-4 striped bass
- Continue to explore approaches and products for communication of results

Acknowledgments

DO Model

Jian Shen & Ben Marcek (FWS)

Vaskar Nepal (VIMS)

Survey Support

VIMS: Wendy Lowery, Jack Buchanan, Chris Bonzek

Recruitment Surveys

Multispecies Research Groups

MD DNR: Eric Durell, Chris Walstrum & survey staff

Funding

Chesapeake Bay Trust

VIMS Office of Academic Studies

Steering Committee

Mandy Bromilow (ERT, Inc)

Simon Brown (MD DNR)

David Bruce (NOAA-NMFS)

Lisa Havel (ASMFC)

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Margaret McGinty (MD DNR)

Olivia Philips & Brooke Lowman (VMRC)

Justin Shapiro (NOAA-CBPO)

Jim Uphoff (MD DNR)

Bruce Vogt (NOAA-CBPO)

Thank you!

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