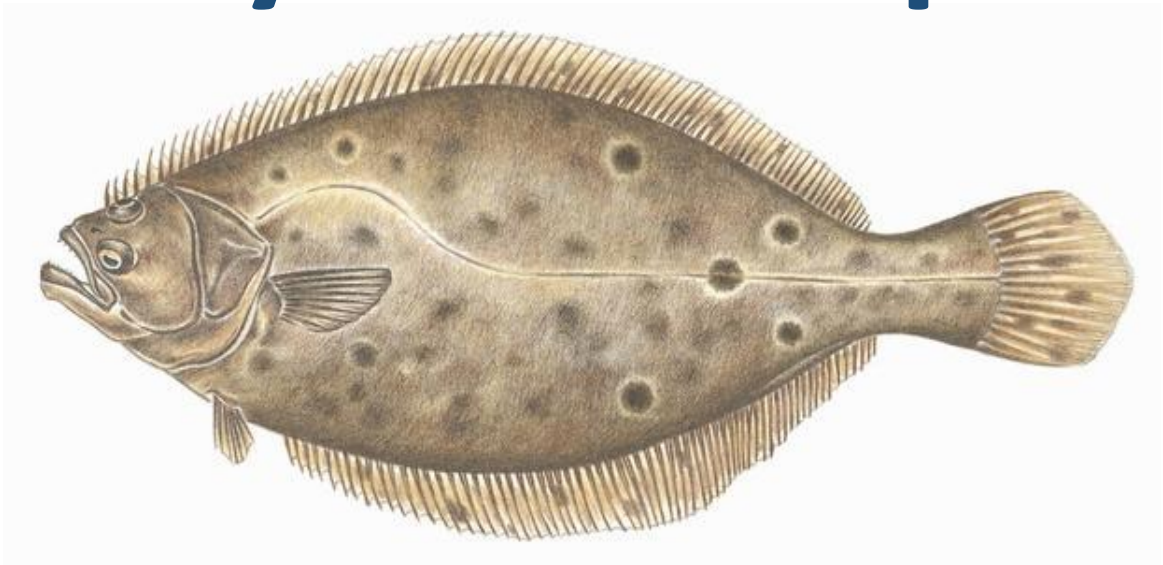
Summer flounder habitat availability in Chesapeake Bay



Jim Gartland

R. Latour, P. St-Laurent, M. Friedrichs, A. Schonfeld

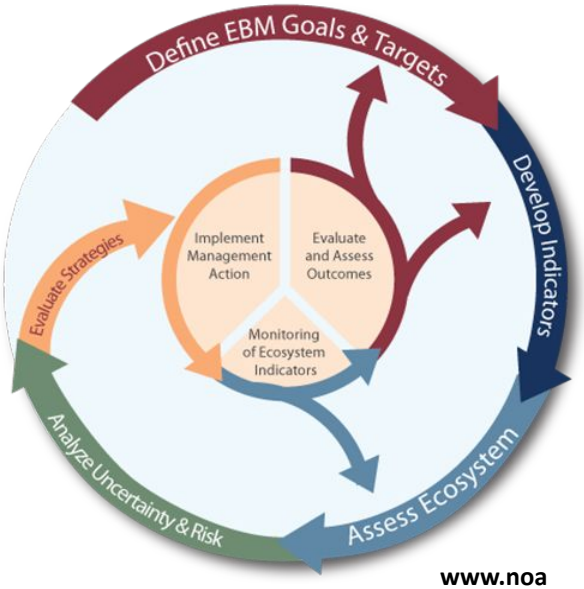
Sustainable Fisheries Goal Implementation Team

June 23, 2021

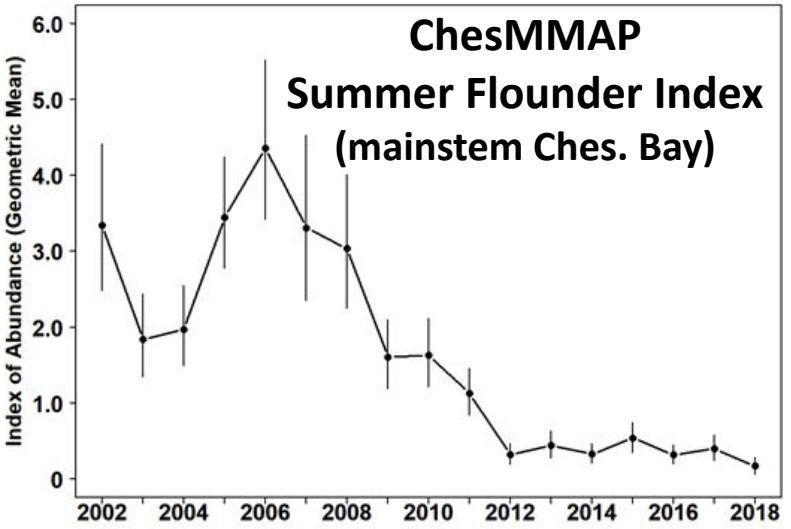
Background: EAFM in the Mid-Atlantic Bight

- Population dynamics driven by harvest; but also species interactions & environmental forcing
- MAFMC concerted effort to operationalize EAFM
  - IEA Framework – Risk Assmnts, Ecosystem Indicators, Conceptual Models, & MSE
  - Summer flounder identified as high-risk stock
  - Estuarine data lacking:

    Limits indicators & risk assessments



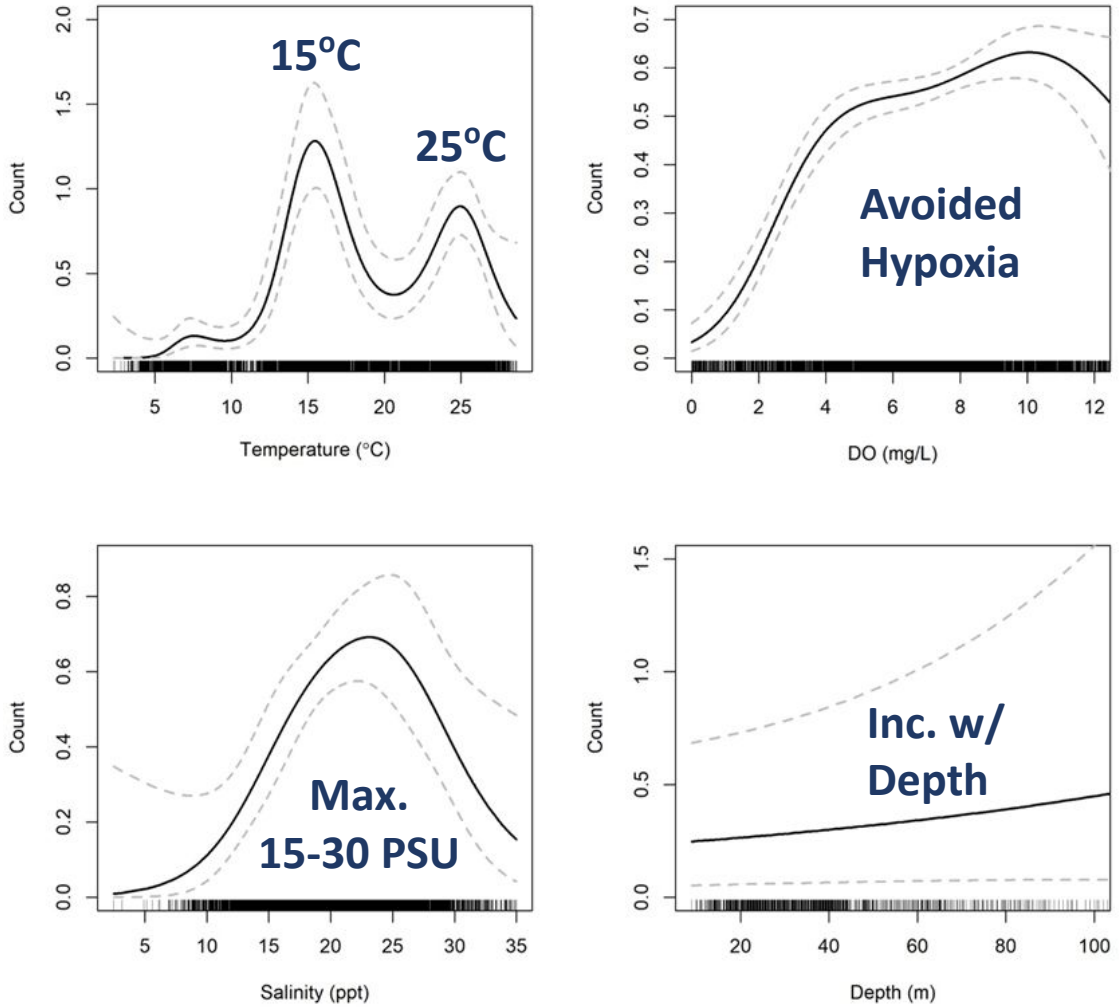
www.noaa.gov



Background: Modelling Activities at VIMS

Summer Flounder Habitat Niche Model

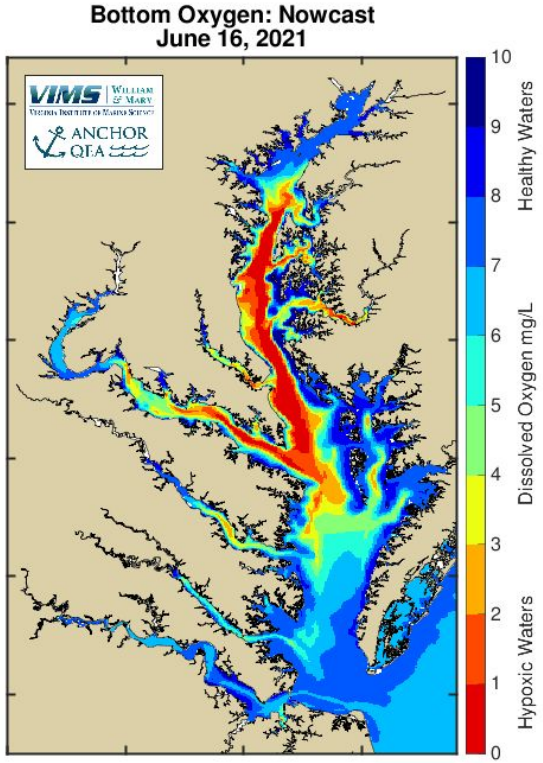
Latour Lab – NCBO support



*Ches*ROMS Estuarine-Carbon-Biogeochem.

M. Friedrichs Lab – NSF, NASA, NOAA, EPA support

- 3D Hydrographic Model
- Water Temp, Salinity Dissolved O_2 Conc.
- 20 Vertical Levels
- 0.6 km^2 Resolution
- Daily Averages



Objectives

COMBINE summer flounder habitat niche model & ChesROMS-ECB model to:

1. **Develop an <u>Annual Habitat Suitability Index</u> (Ecosystem Indicator) for summer flounder in Chesapeake Bay**

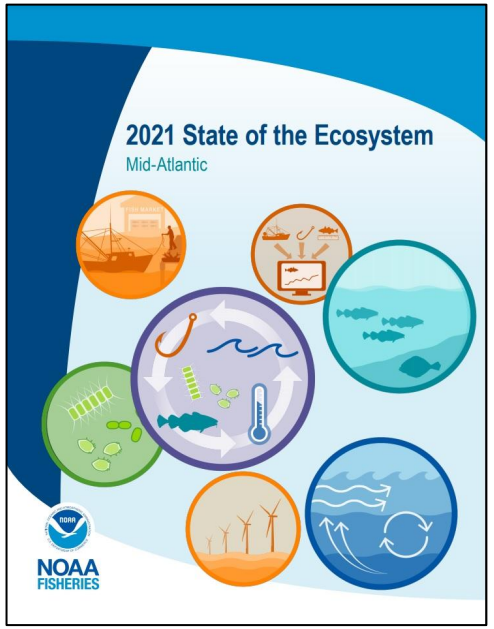
2. **Investigate bimodal relationship betw. summer flounder relative abundance & water temperature in Chesapeake Bay**

   (Hypoxia Displacement?, Edge Effects?)

Objective 1: Annual HSI for Summer Flounder, 2002-2020

*Ches*ROMS-ECB (WT, SA, DO)

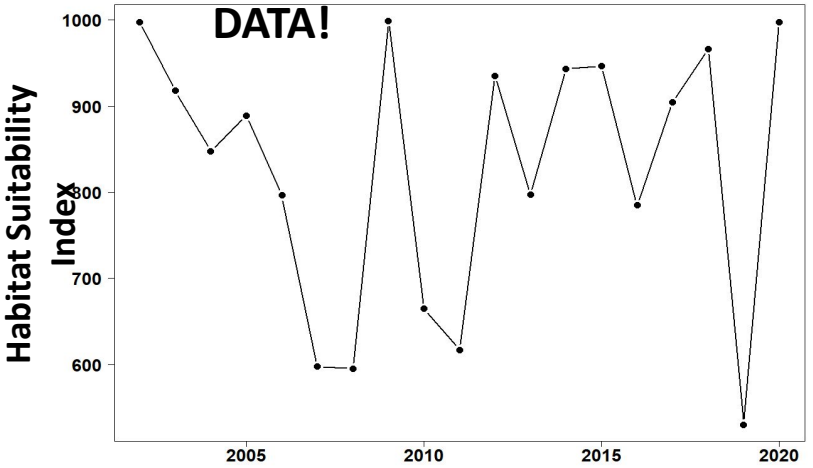
- Spatial: All cells in mainstem bay w/in 1 m of bottom
- Temporal: March 1 – Nov 30, 2002-2020 (daily)
- Average hydrographic for each cell across days to yield monthly mean distributions by year



SF Habitat Niche Model

- ChesROMS output to predict CPUE (HSI) per cell for each mo/yr
- Within year, calc mean HSI per cell across months
- Sum mean HSI values; yields annual HSI index

Example HSI: MOCK DATA!



Objective 2: Bimodal Relative Abundance v. Temperature

*Ches*ROMS-ECB (WT, SA, DO)

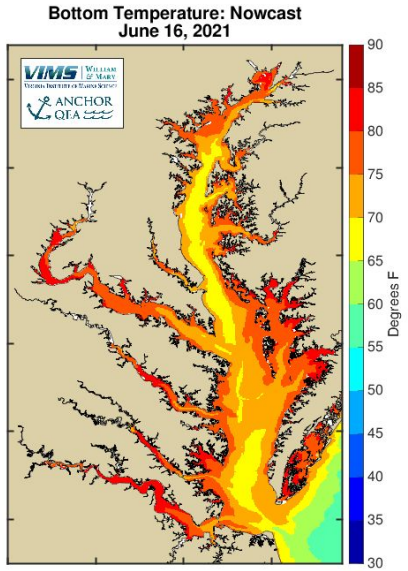
- Same approach as Objective 1 to 'feed' niche model
- Calc. mean WT, SA, DO per cell per month (acr. years)

SF Habitat Niche Model

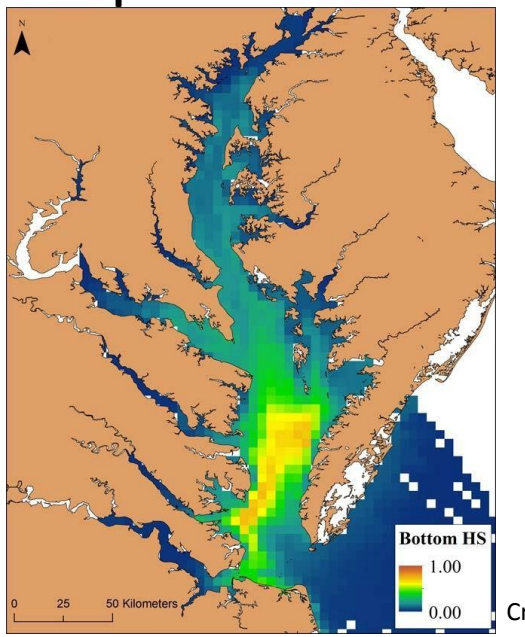
- ChesROMS output to predict CPUE (HSI) per cell for each mo/yr
- Calc mean HSI per cell per month (acr. years)

Compare mean monthly HSI & hydrographic distributions

- Gain insight into bimodal rel. abund. vs WT
- Hypoxia influence: displacement & edge effects



Example HSI Distribution



Crear et al. 2020

Application

- Generate estuarine Ecosystem Indicator(s) for MAFMC SOE & Risk Assessments
- Identify drivers of Summer Flounder decline in Chesapeake Bay
- Create a baseline to evaluate future impacts of climate change
- Yield insight into bimodal relationship betw. relative abundance & water temp
- Develop a framework to generate HSI Ecosystem Indicators for other species in Chesapeake Bay (e.g., Atl. croaker, spot, weakfish, scup, windowpane, etc.)

Timeline

Activity	2021					2022		
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Generate Hydrographic Data; ChesROMS Model								
Obj. 1: Summer Flounder Habitat Suitability Index								
Obj. 2: Bimodal Relationship Rel Abund & Temp								
Prepare & Submit Manuscript								
Generate Project Outreach								


Thank you!