NCCOS NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

NOAA COOPERATIVE OXFORD LABORATORY
COASTAL CHANGE, RISK AND RESILIENCE

Project Overview

Modeling to Support Blue Crab Resilience in Chesapeake Bay
Science Area(s): Coastal Change, Technology Transfer
Region(s) of Study: Chesapeake Bay, MAB, Maryland, Virginia
Primary Contact(s): doug.pirhalla@noaa.gov
This project began in October 2024 and is expected to end in December 2027.

Doug Pirhalla, Res. Physical Scientist

DEFINITION

The Cooperative Oxford Laboratory (COL) conducts research and modeling on environmental impacts and hazards to support ecosystem and coastal community resiliency, restoration, and public safety response. For this portfolio, data science and modeling are used to build new tools and information on coastal impacts from storms, sea level rise, coastal floods, turbid waters, thermal stress events, and changing weather and ocean conditions. Understanding and predicting coastal conditions and hazards is critical for management planning, preparedness and response.

Integrated Data Science and Modeling Portfolio transforms global- scale data to regional and local-patterns of variability, making it more useful for impact analyses and predicting future outcomes.

PROJECT GOALS AND OBJECTIVES

To understand and predict the impacts of changing environmental conditions on blue crab abundance and resilience in the Bay, and incorporate this knowledge into next generation modeling systems and tool development.

Threats include shifts and extremes in temperature, and precipitation, changing winds, circulation, storm patterns (and ocean patterns), have facilitated the need for new modeling tools and information to better understand and predict environmental risk.

Data science solutions and new models will be produced

Overarching goals- *To support improved facilitation and transfer of NCCOS research products and information into prediction tools and coastal decision- support applications for end users.*

PLANNED APPROACH

Through collaborations with the NCCOS Cooperative Oxford Laboratory (COL), Kent State University (KSU) and Smithsonian Environmental Research Center (SERC), with partners from NCCOS' Stressor, Detection and Impacts Division (SDI), the Virginia Institute of Marine Science (VIMS), in collaboration with NCBO, this project will leverage an existing NCCOS/KSU and PAF supported modeling framework:

(https://coastalscience.noaa.gov/project/weather-and-water)

PAF Project page:
(https://coastalscience.noaa.gov/project/bluecrab)

TECHNICAL APPROACH

Inputs/Outputs: General Classification Methods

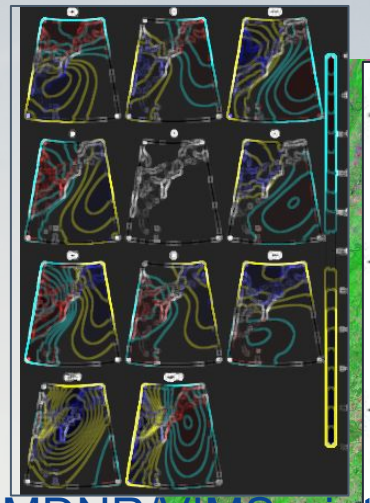
Atmospheric Patterns: ERA5
Sea level pressure, winds (stress, curl, mag), Temp., ppt, cyclones, anticyclones (KSU, Applied Climatologists, Inc.)

Ocean Patterns: CBEFS water temperature, salinity, current velocities, DO (Applied Clim.)

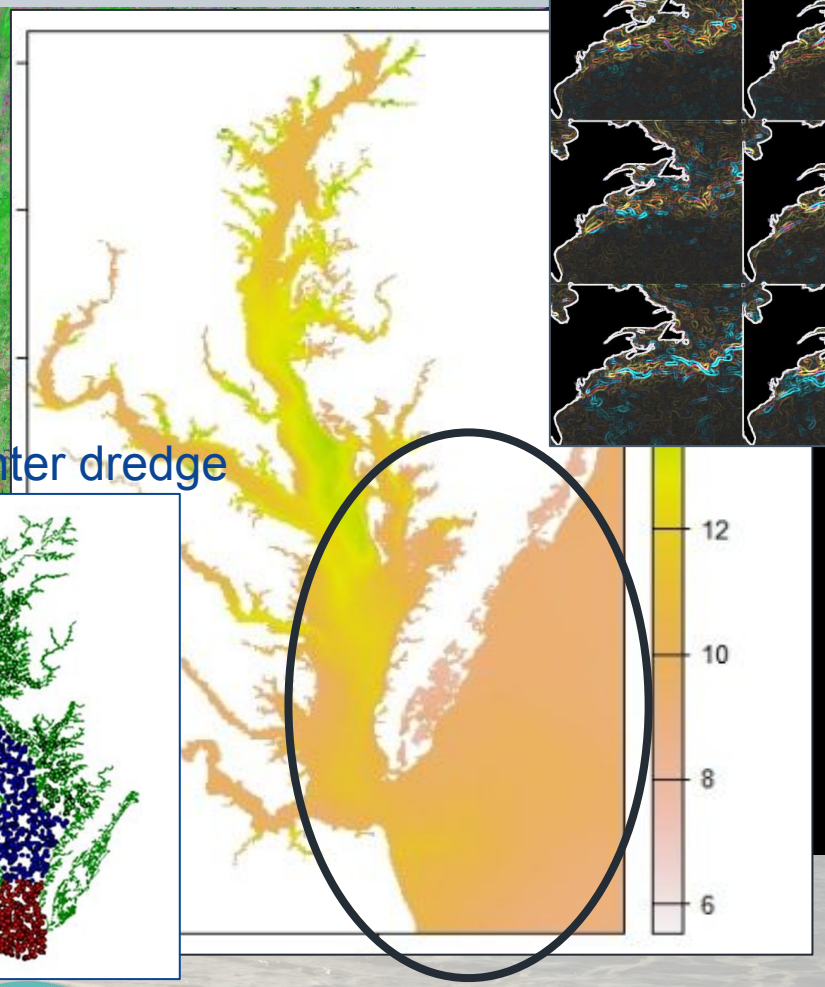
Satellite Climatology: SST, SST Fronts, SST variability patterns, SSHA (NCCOS)

Blue crab population metrics (SERC)

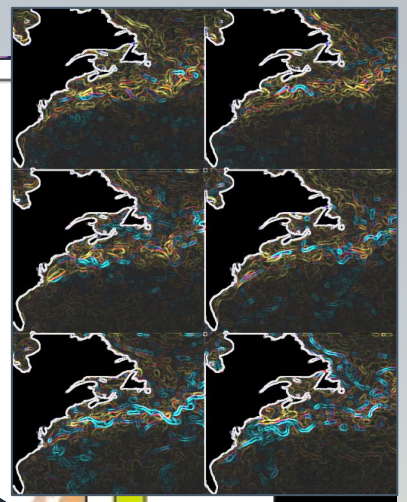
ERA-5 ATMOSPHERIC



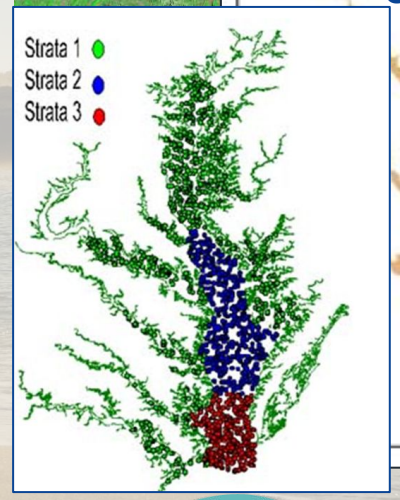
CBEFS ROMS



OSTIA SST Fronts



MDNR/VIMS winter dredge



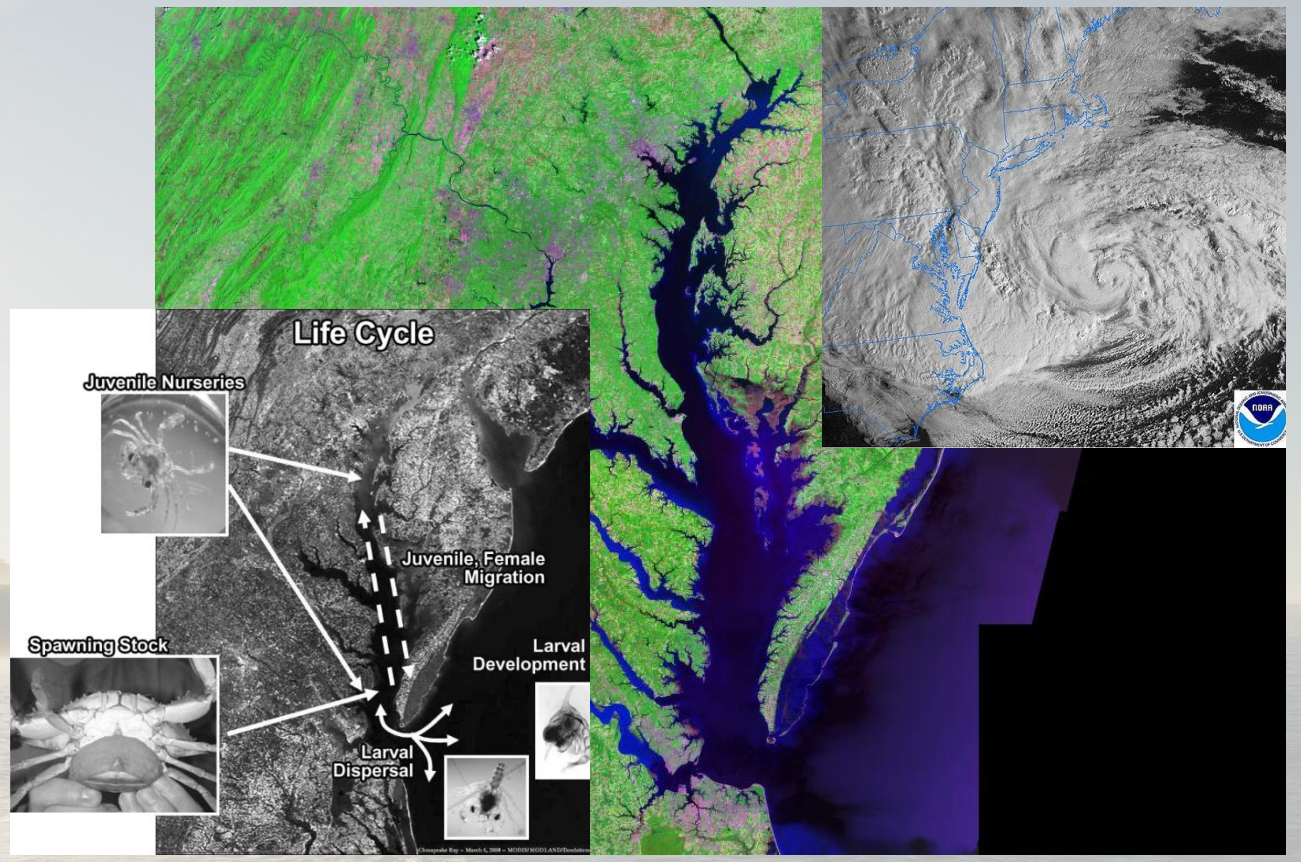
TASKS AND ANTICIPATED MILESTONES:

Phase 1, Year 1-

- Data Acquisition and processing (NCCOS/Applied Climatologists, Inc.)
- Atmospheric- Ocean Classifications and Folios: SLP, winds, Temp., ppt, cyclones, anticyclones, water temperature, salinity, current velocities, DO (Applied Clim.)
- Blue crab population metrics (SERC)

Phase 2, Year 2 and 3-

- Environmental Indicator Modeling
- Ranked Weather- water types (Wx/Wa; Year 3).
- Summary Report and write ups



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OTHER PROJECTS AND COLLABORATIONS:

Atmospheric drivers of sea-level fluctuations and nuisance floods along the mid-Atlantic coast of the USA

Scott C. Sheridan[1] · Douglas E. Pirhalla[2] · Cameron C. Lee[1] · Varis Ransibrahmanakul[2]

Seasonal-to-interannual prediction of North American coastal marine ecosystems: Forecast methods, mechanisms of predictability, and priority developments

Michael G. Jacox[a,b,*], Michael A. Alexander[b], Samantha Siedlecki[c], Ke Chen[d], Young-Oh Kwon[d], Stephanie Brodie[a,e], Ivonne Ortiz[f,g], Desiree Tommasi[e,h], Matthew J. Widlansky[i], Daniel Barrie[j], Antonietta Capotondi[b,k], Wei Cheng[f,l], Emanuele Di Lorenzo[m], Christopher Edwards[n], Jerome Fiechter[n], Paula Fratantoni[o], Elliott L. Hazen[a], Albert J. Hermann[f,l], Arun Kumar[p], Arthur J. Miller[q], Douglas Pirhalla[r], Mercedes Pozo Buil[a,e], Sulagna Ray[c], Scott C. Sheridan[s],

Atmospheric Pattern–Based Predictions of S2S Sea Level Anomalies for Two Selected U.S. Locations

CAMERON C. LEE,[a] SCOTT C. SHERIDAN,[a] GREGORY P. DUSEK,[b] AND DOUGLAS E. PIRHALLA[c]

Atlantic Coastal Sea Level Variability and

DOUGLAS E. PIRHALLA,[a] CAMERON C. LEE,[b] SCOTT

A novel applied climate classification method for assessing atmospheric influence on anomalous coastal water levels

Cameron C. Lee[1] | Scott C. Sheridan[1] | Douglas E. Pirhalla[2] | Varis Ransibrahmanakul[2] | Gregory Dusek[2]

Observational Needs Supporting Marine Ecosystems Modeling and Forecasting: From the Global Ocean to Regional and Coastal Systems

Antonietta Capotondi[1,2], Michael Jacox[2,3,4], Chris Bowler[5,6], Maria Kavanaugh[7], Patrick Lehodey[8], Daniel Barrie[9], Stephanie Brodie[3,4], Samuel Chaffron[6,10], Wei Cheng[11,12], Daniela F. Dias[13], Damien Eveillard[6,10], Lionel Guidi[6,14], Daniele Iudicone[15], Nicole S. Lovenduski[16], Janet A. Nye[17], Ivonne Ortiz[11], Douglas Pirhalla[18], Mercedes Pozo Buil[3,4], Vincent Saba[19], Scott Sheridan[20],*

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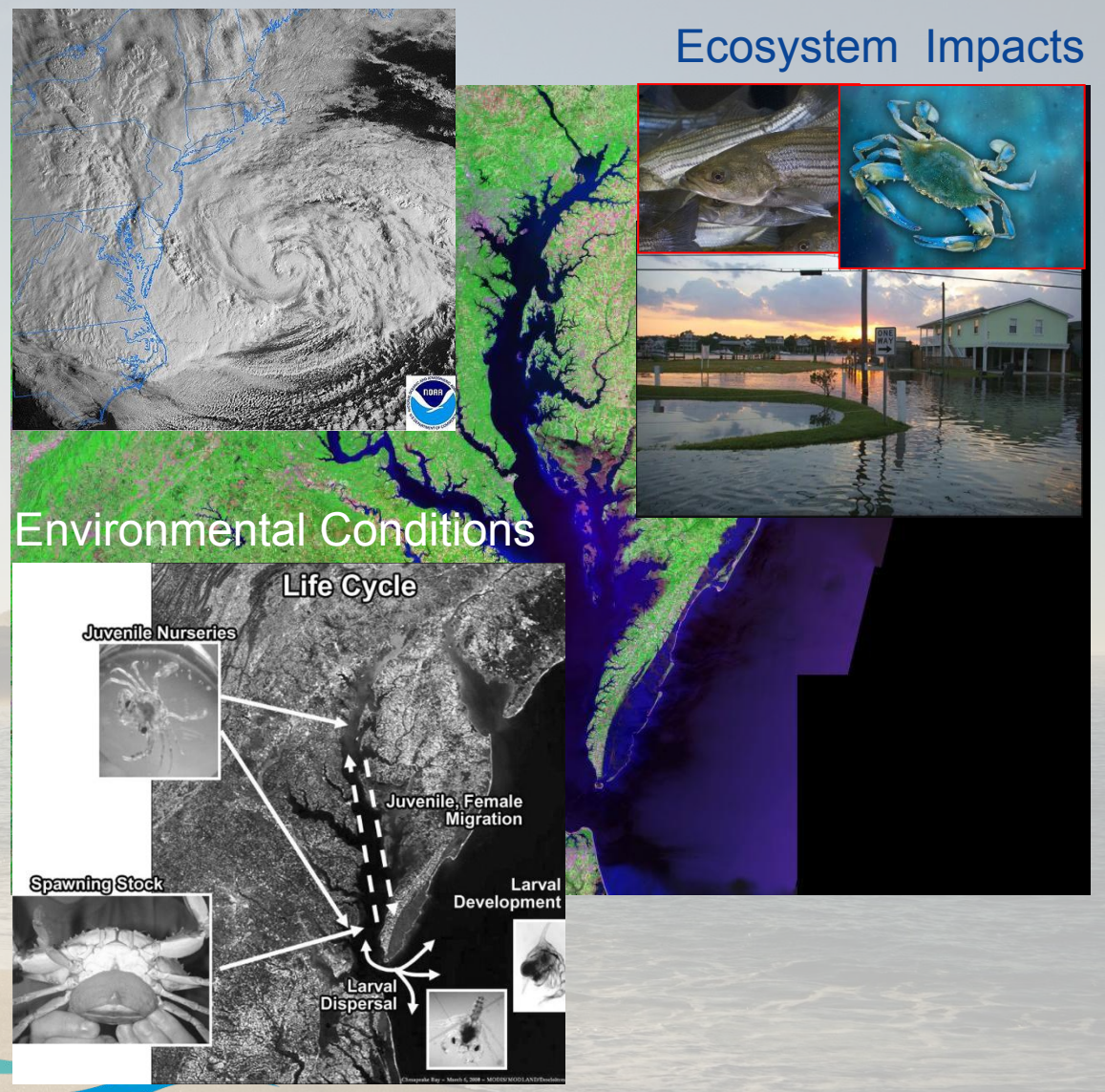
BENEFITS OF THE WORK

Portable science solutions for understanding and predicting effects on blue crabs which could be applied to other valued resources in the bay.

New tools and predictions of key conditions improves links to management for measuring and tracking rates and severity of change in systems

Increased understanding of drivers related to good and bad recruitment years, and trends



WHO WE WORK WITH

NCCOS Staff- 3 (Ransi, Kimbrough, Pirhalla)

Kent State University via CLIMRise and Applied Climatologists, Inc.
(Cameron Lee, Scott Sheridan and Associates)

Smithsonian Environmental Research Center
(Matt Ogburn and Associates)

More details found here:
https://modeling to support blue crab resilience
https://climate.kent.edu/
https://serc.si.edu/labs/fisheries-conservation

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Thank You!

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