Recommendations for Developing a Statewide New Jersey Ocean Acidification Monitoring Network

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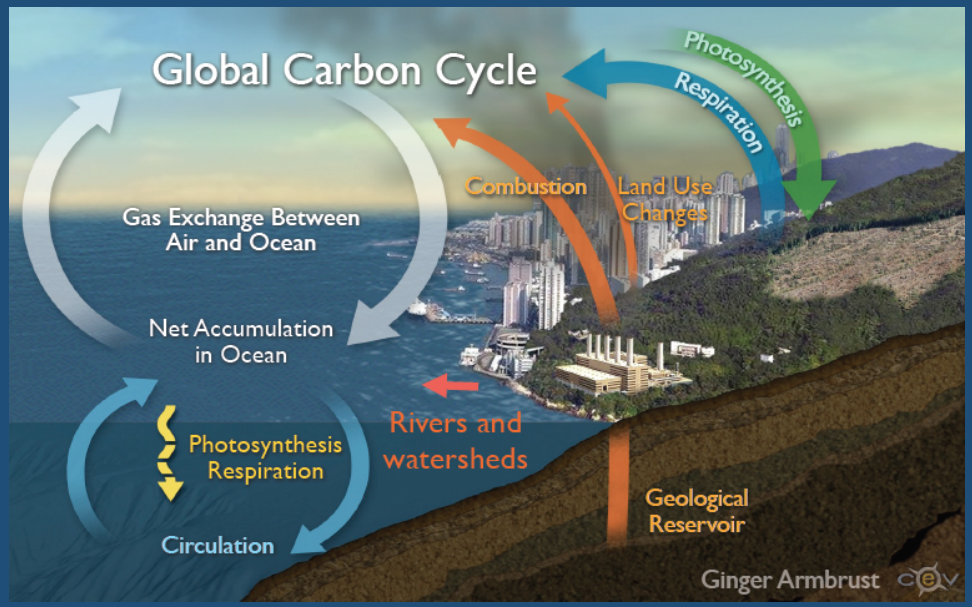
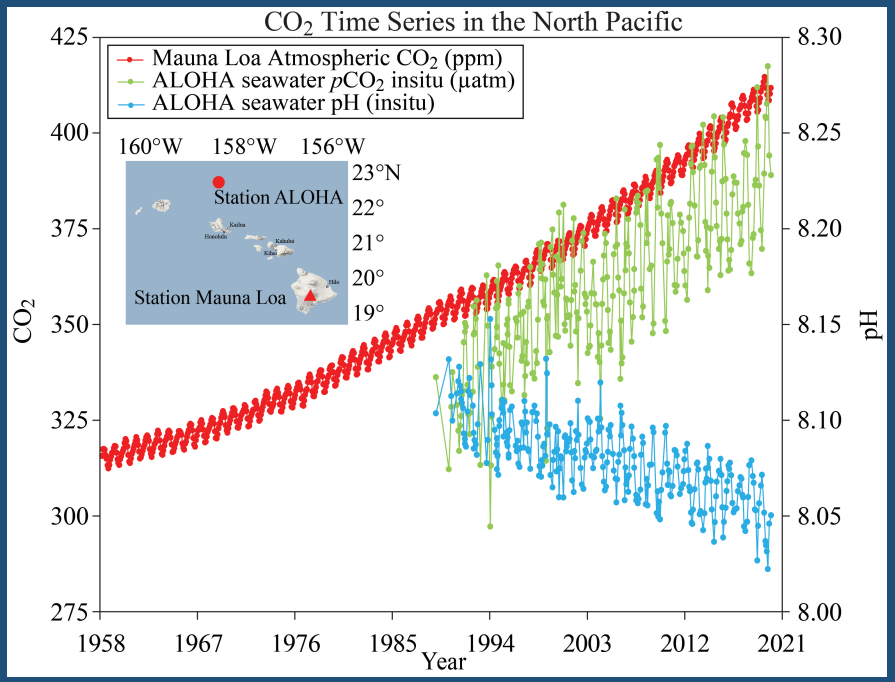
NJCMP OA Team

Ocean Acidification

Driven by the ocean's absorption of increasing atmospheric carbon dioxide (CO_2)



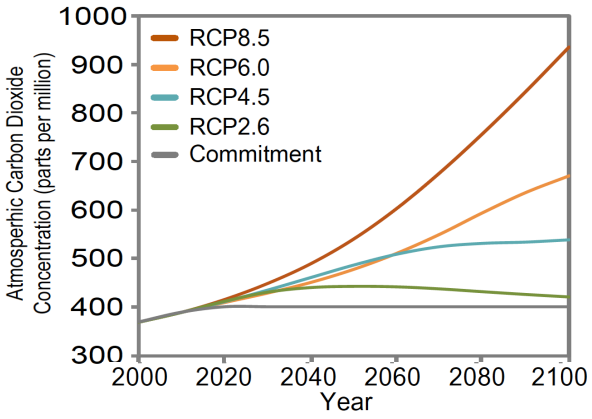


Atmospheric CO_2 increased 40% since 1800s

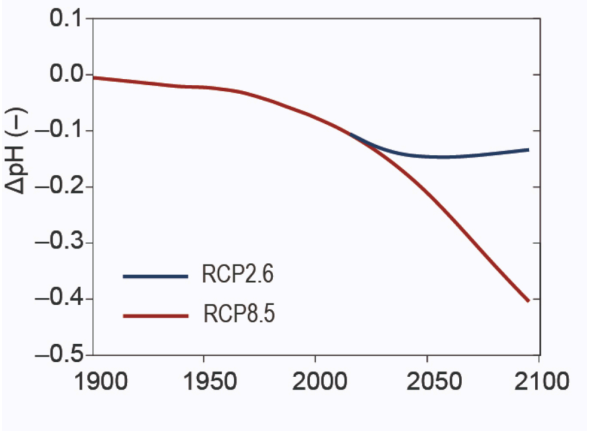
- Drop of 0.1 pH unit
- 28% increase in ocean acidity

Data:
Mauna Loa: ftp://aftp.cmdl.noaa.gov/products/trends/co2/co2_mm_mlo.txt
ALOHA: http://hahana.soest.Hawaii.edu/hot/hog-dogs/bextraction.html

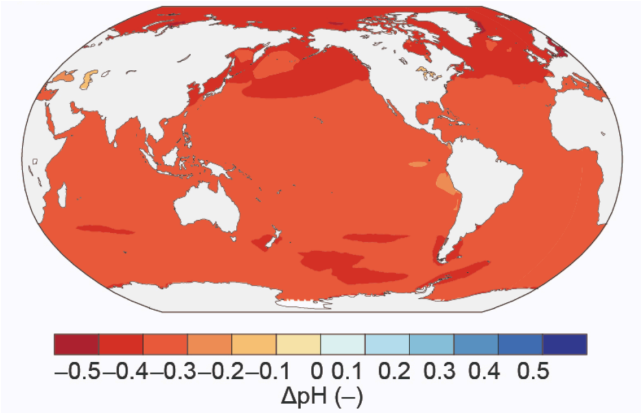
Projections of Ocean Acidification: pH



Fourth National Climate Assessment, 2017



IPCC Special Report on Climate Change, 2019



IPCC Special Report on Climate Change, 2019

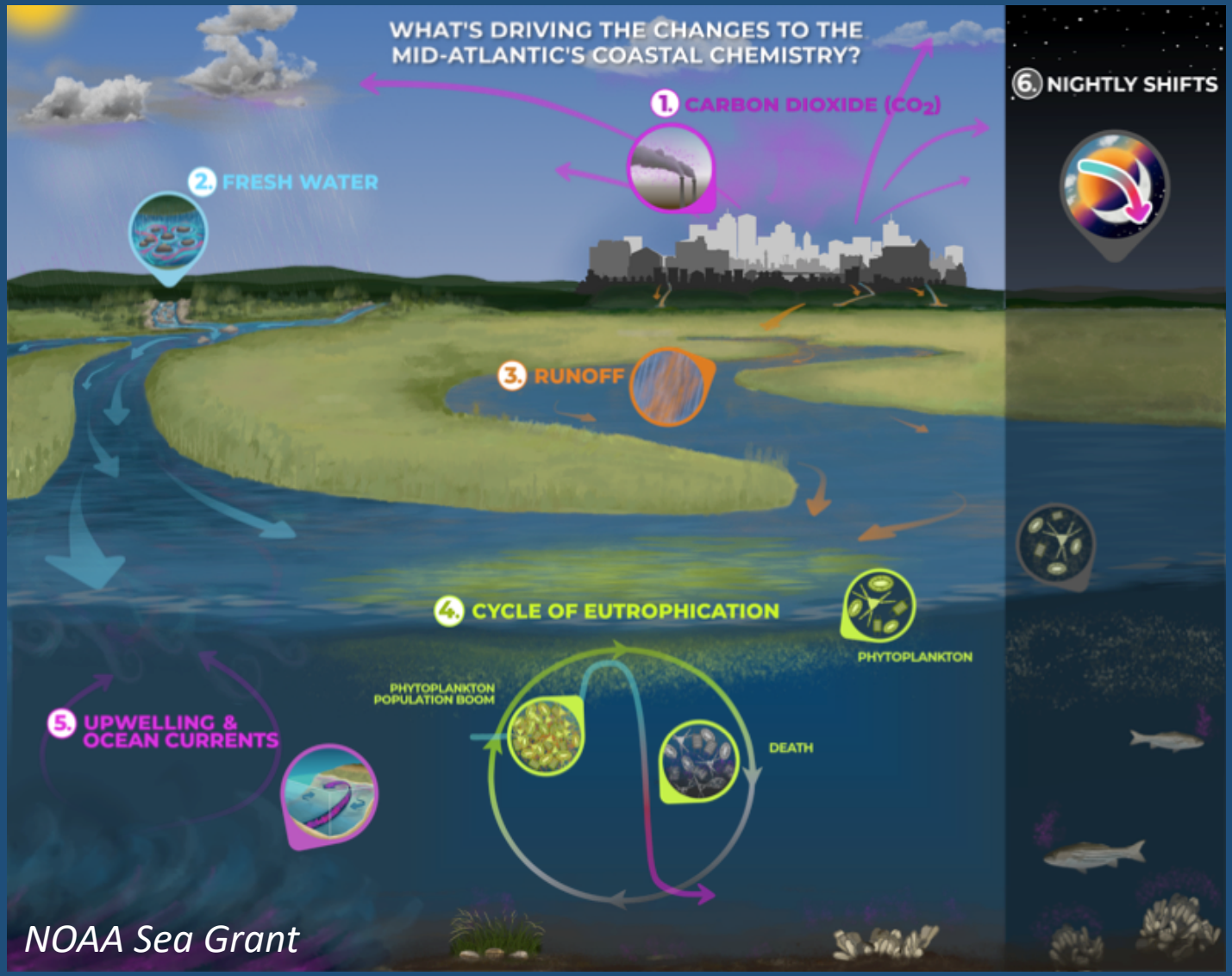
CO_2 is projected to double by 2100 (IPCC)

- Additional drop of 0.2-0.3 pH units
- Equivalent to 100-150% increase in ocean acidity

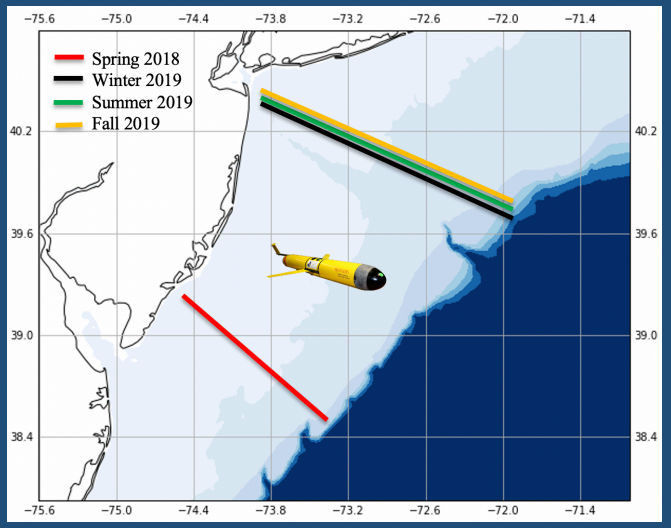
↓ pH ↓ CO_3^{2-} ↓ Ω_{arag}

Coastal & Ocean Acidification

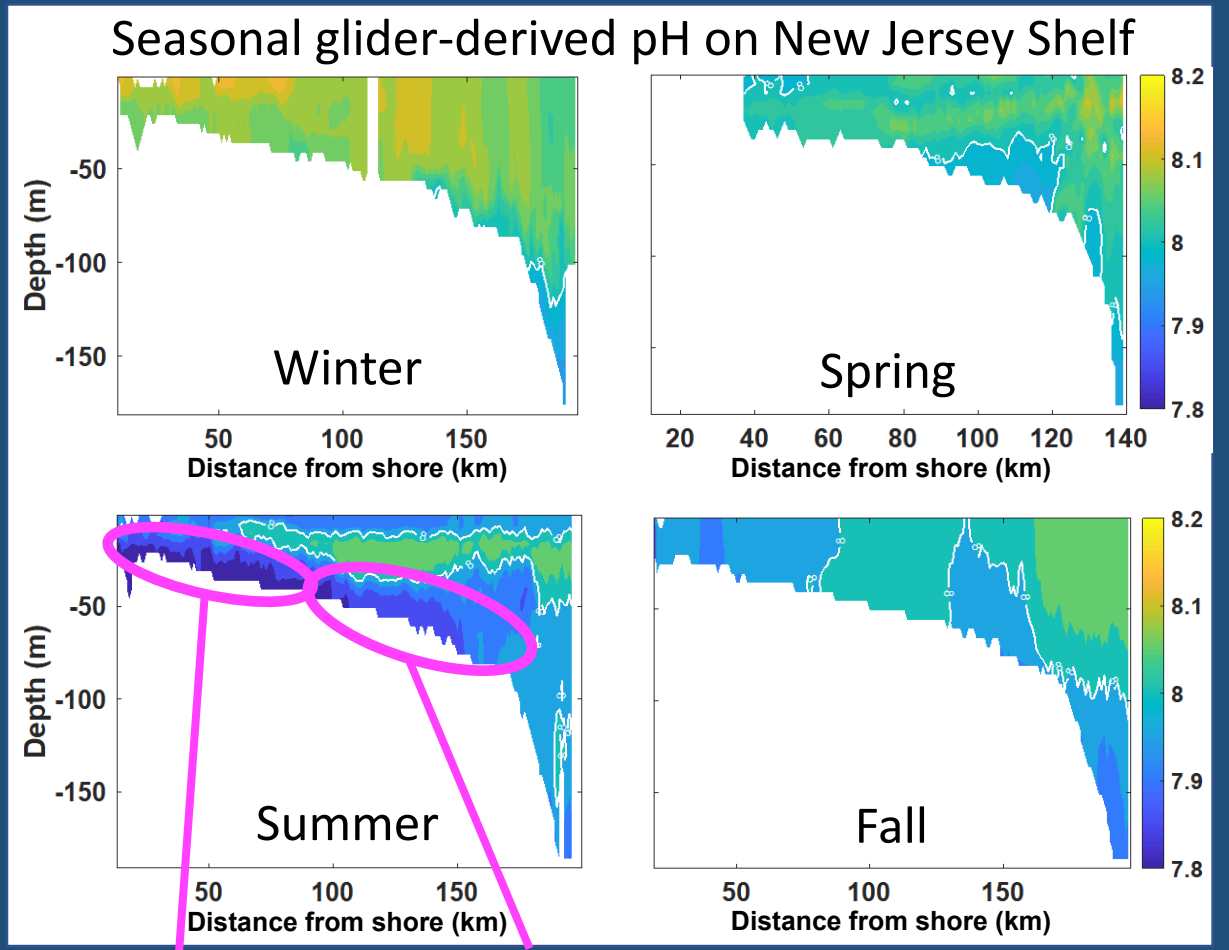
High variability and complexity in coastal shelf systems

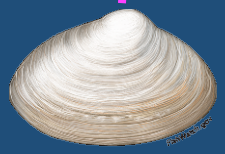


NJ Observations - Gliders



- Understand the baseline/climatology of OA conditions
- What are the seasonal conditions in known shellfish habitats?





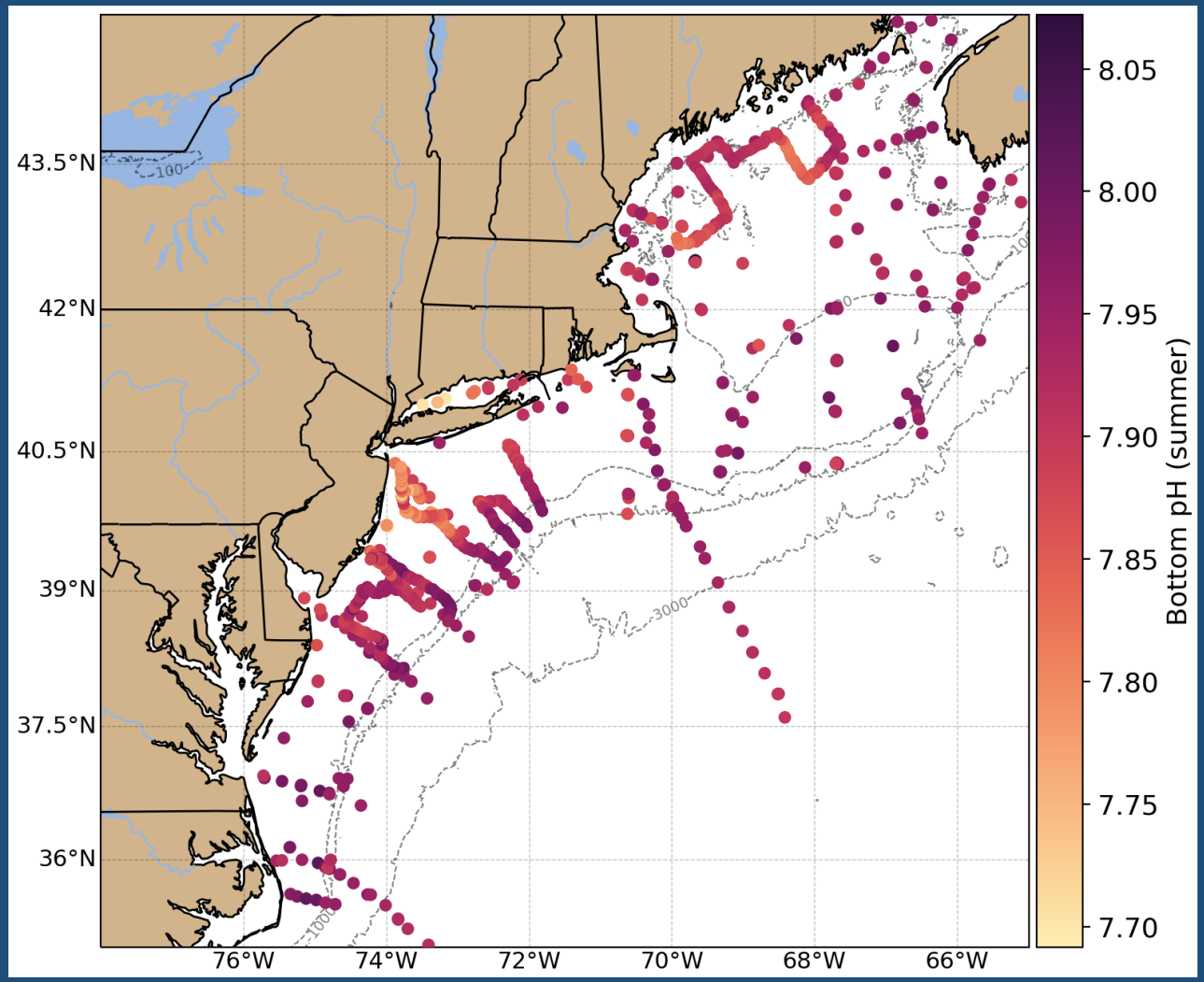
Atlantic Surfclam
Spisula solidissima

Atlantic Sea Scallop
Placopecten magellanicus

Saba et al., 2019

Wright-Fairbanks et al., 2020

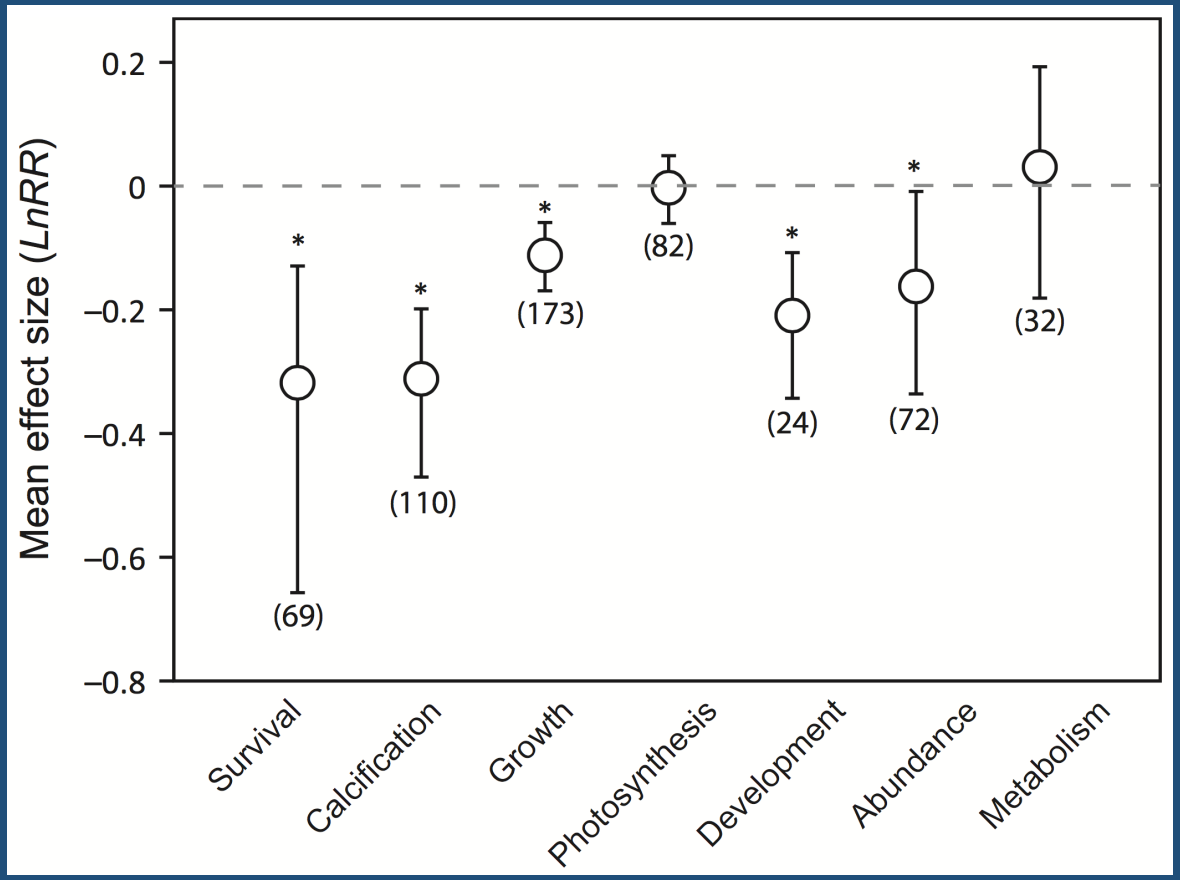
U.S. NES Observations



Summer bottom pH (2007-present)

State of the Ecosystem 2022: Mid-Atlantic (report for MAFMC)

Acidification Impacts on Organisms



Kroeker et al. 2013

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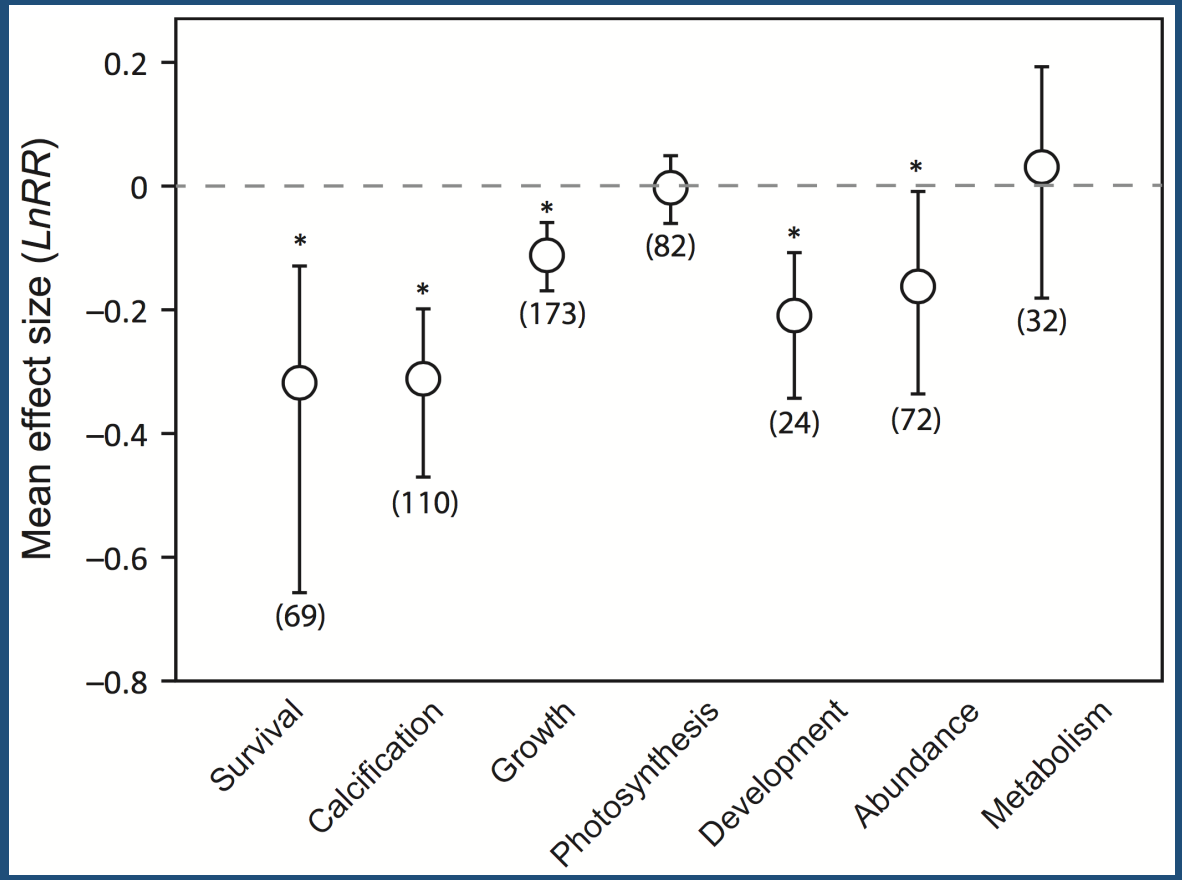


Kroeker et al. 2013

AND.....

- Reproduction
- Behavior
- Swimming ability

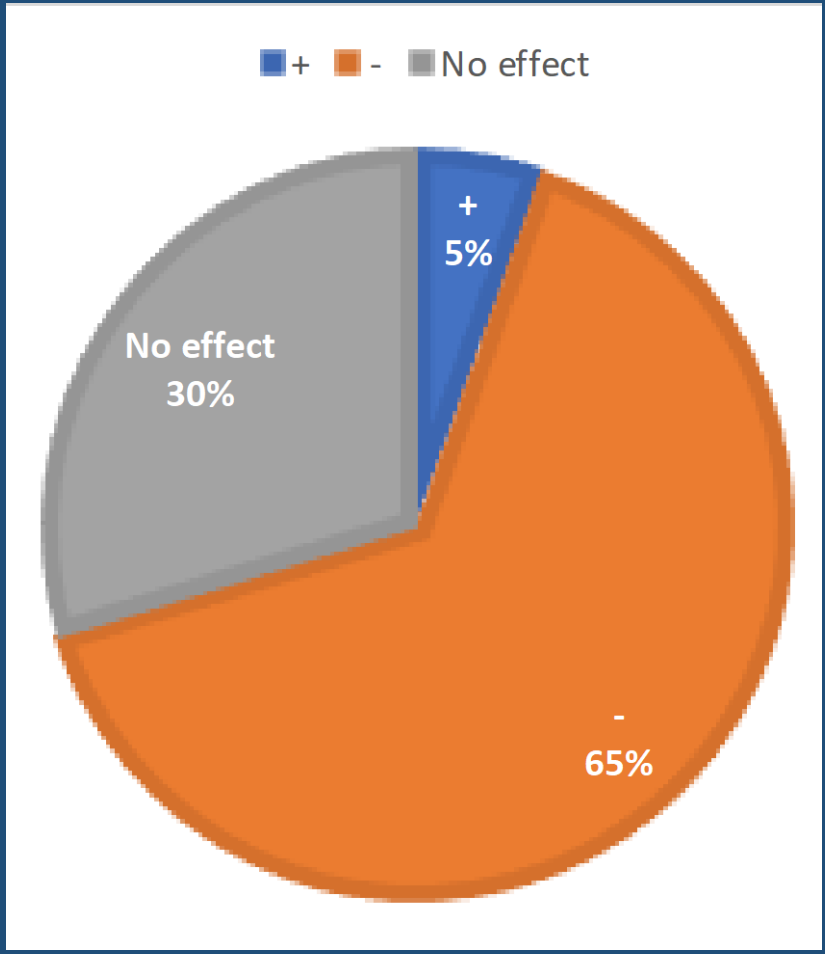
➢ Biotic interactions
➢ Biodiversity
➢ Ecosystem
➢ Acclimation???
➢ Adaptation???

Potential Impacts on Mid-Atlantic Species

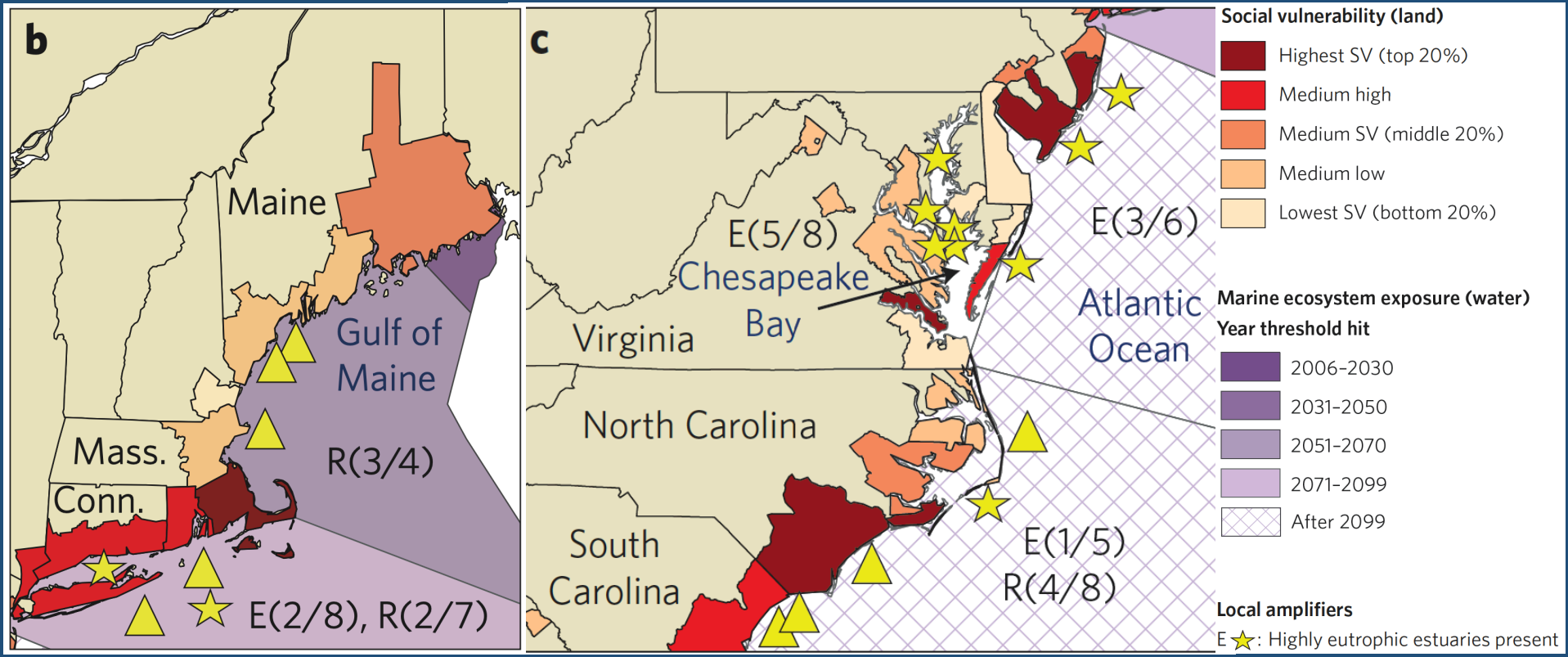
Saba et al., 2019: Estuarine, Coastal and Shelf Science

Data compiled from a review of acidification and multi-stressor studies conducted on economically important groups and species in the Mid-Atlantic:

- 18 species comprising of crustaceans, mollusks, finfish and elasmobranchs (from 59 studies)
- Species managed by MAFMC, ASMFC, NEFMC, NOAA and/or States
- Wide range of response variables



High Regional Social Vulnerability



Ekstrom et al. 2015

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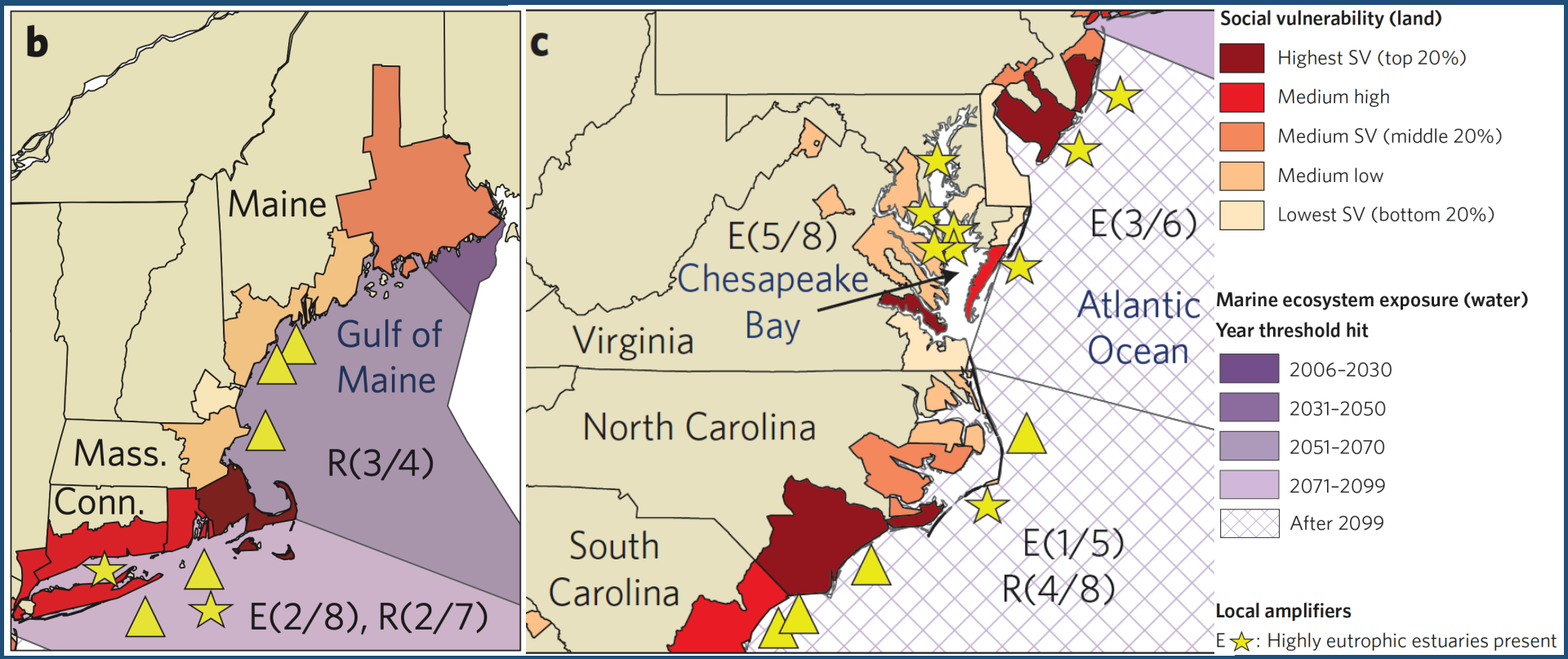
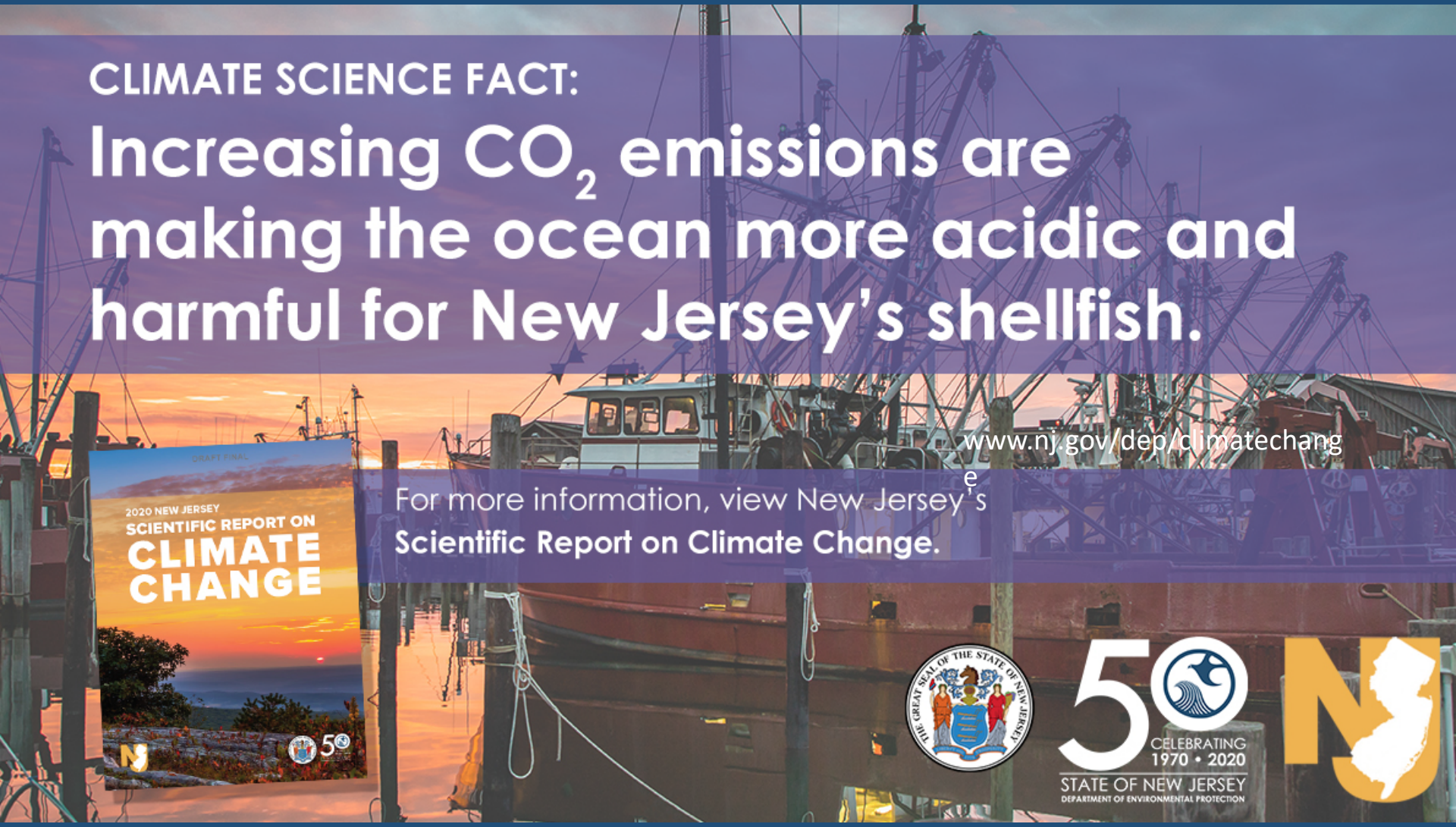


Ekstrom et al. 2015

- NJ is predicted to be at high risk of economic harm from OA conditions.
- Southern NJ counties rank 2nd in the U.S. in economic dependence on shellfish, which could suffer from increasing ocean acidity.

New Jersey's climate change and ocean acidification efforts were advanced by Executive Order 89 which was signed into law by Governor Murphy in 2019



NJDEP-Rutgers Collaborative Efforts

- Bureau of Climate Resilience Planning and Bureau of Marine Water Monitoring form NJ's OA Team
- NJCMP OA Team Engages with Rutgers
- Goals of collaborative efforts:
  - Learning OA Action Planning from other coastal states
  - Outlining elements to use in NJ's OA Action Plan
  - Filling knowledge gaps in the science
- Key takeaway: ***Developing a comprehensive, statewide monitoring network is an essential foundation to a state OA initiative***

Developing the NJ OA Monitoring Network

- Task 1: Identify and engage potential partners to plan for a statewide Acidification Monitoring Network

- Task 2: Convene a virtual workshop to outline approach for developing a statewide Acidification Monitoring Network (November 2021)

- **Task 3: Engaging stakeholders in a proposed monitoring network**
  - Convey how a statewide monitoring network would greatly enhance knowledge on potential risks to specific species and ecosystems in New Jersey
  - Obtain feedback on interest and willingness to modify existing facilities or field efforts to optimize/expand the statewide monitoring network
  - Obtain feedback on logistical considerations for adding carbonate chemistry sensors or measurements into their operations

Steps Toward Developing a Statewide OA Monitoring Network

1. Convene an OA Task Force
    a. Task 1: Inventory Current Monitoring Assets
    b. Task 2: Assessment of Gaps in Monitoring
    c. Task 3: Prioritize and fill gaps to improve network

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2. Enhance availability for discrete sample analysis
3. Adopt Community Best Practices to Ensure Data Quality Control
4. Develop Network Data Management
5. Coordinate the OA Network

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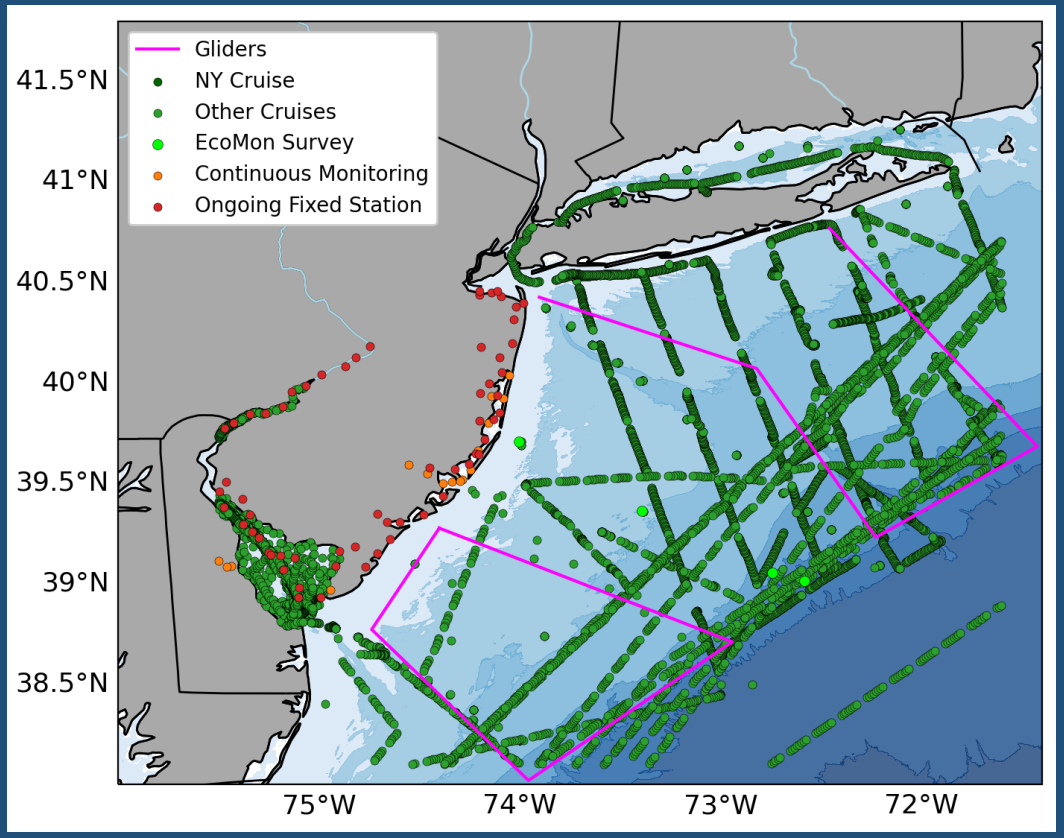

Goldsmith et al., 2019

Observation Needs:

- *Higher sampling frequency*
- *Monitor across a salinity gradient*
- *Measurements of multiple carbonate chemistry parameters*
- *Higher-resolution depth-profiling measurements*
- *Observe OA with other stressors*
- *Co-located biological response monitoring*
- *What monitoring is required to understand baseline conditions?*

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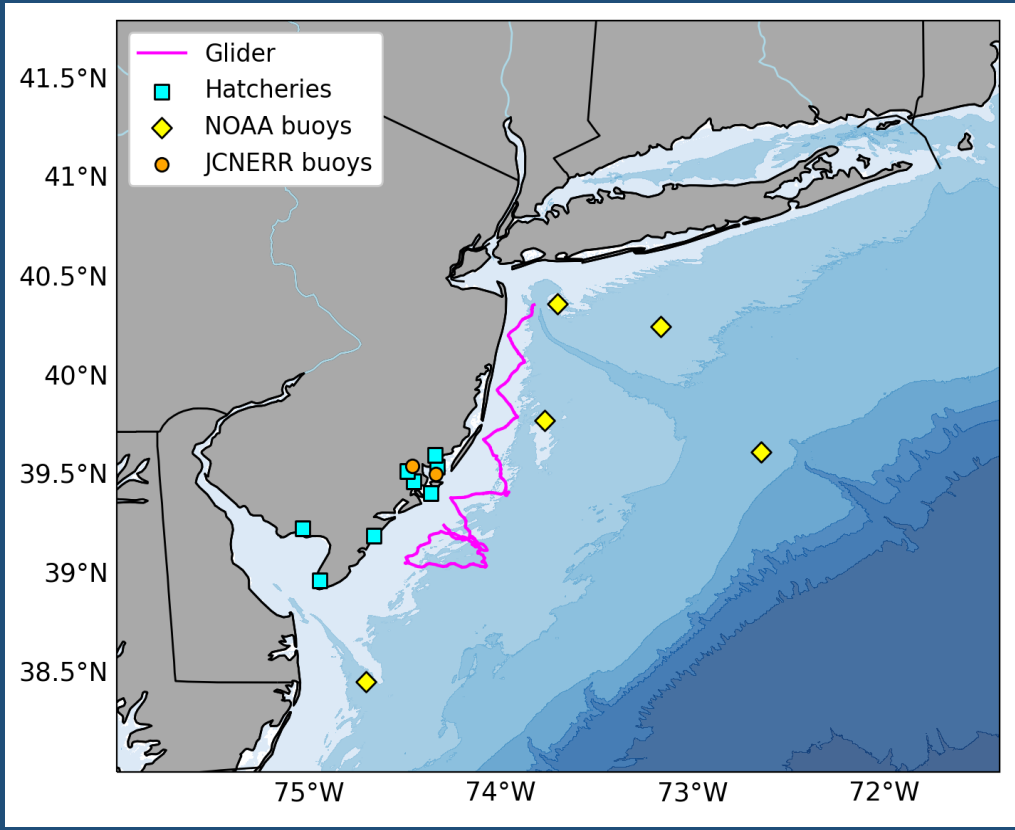

Opportunities to Fill Gaps:

- *Use repository of ongoing OA monitoring locations/cruises*
- *Coordinate with partner agencies to add carbonate chemistry parameters to existing monitoring stations*
- *Enhance nearshore monitoring using gliders*
- *Partner with industry groups to begin monitoring at economic sites of interest*

Engaging YOU in a proposed monitoring network

- Obtain feedback on interest and willingness to modify existing facilities or field efforts to optimize/expand the statewide monitoring network

- Obtain feedback on logistical considerations for adding carbonate chemistry sensors or measurements into their operations

Let's Discuss!

Thanks!

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