Climate Change Impacts on New Jersey: Ocean Acidification

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NJCMP OA Team
Ocean Acidification

Driven by the ocean’s absorption of increasing atmospheric carbon dioxide (CO₂)

Atmospheric CO₂ increased 40% since 1800s
- Drop of 0.1 pH unit
- 28% increase in ocean acidity
- Projected 100-150% increase by 2100

Data:
Mauna Loa: ftp://aftp.cmdl.noaa.gov/products/trends/co2/co2_mm_mlo.txt
CO₂ is projected to double by 2100 (IPCC)

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

High variability and complexity in coastal shelf systems.
Acidification Impacts on Organisms

- Mortality
- Decreased calcification
- Decreased growth
- Impaired development
- Changes in energy allocation
NJ Observations - Gliders

• Understand the baseline/climatology of OA conditions

• What are the seasonal conditions in known shellfish habitats?

Seasonal glider-derived pH on New Jersey Shelf

Winter

Spring

Summer

Fall

Saba et al., 2019

Wright-Fairbanks et al., 2020
Upwelling in MAB

Sustained South/Southwest Winds & Upwelling

July 2014

Sea surface temperature (ºC)

Date and Time

pH near water intake

pH

6/15/14 0:00
6/20/14 0:00
6/25/14 0:00
6/30/14 0:00
7/5/14 0:00
7/10/14 0:00
7/15/14 0:00
7/20/14 0:00
7/25/14 0:00

Daphne Munroe & Sarah Borsetti (Rutgers), Matthew Poach (NOAA), Ian Abrahamsen (Univ. of Pittsburgh)
High Regional Social Vulnerability

Ekstrom et al. 2015
• NJ is predicted to be at high risk of economic harm from OA conditions.
• Southern NJ counties rank 2\textsuperscript{nd} in the U.S. in economic dependence on shellfish, which could suffer from increasing ocean acidity.

\textit{Ekstrom et al. 2015}
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
We are already seeing potentially impacted habitats.
Industry Need Leads to Policy Actions

80% decrease in oyster production in 2008/2009 linked to ocean acidification
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Ocean Acidification Blue Ribbon Panel

A panel of science and policy experts to address the effects of OA on WA's shellfish resources

In March, Gov. Chris Gregoire convened an Ocean Acidification Blue Ribbon Panel, the first of its kind in the nation.

- Convened in 2012
- Identified 42 actions toward increasing “capacity to understand, reduce, remediate, and where possible adapt to the consequences of ocean acidification” – First state OA Action Plan
- Region-wide impact led to multi-state Pacific Coast Collaborative
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.

CLIMATE SCIENCE FACT: Increasing CO₂ emissions are making the ocean more acidic and harmful for New Jersey’s shellfish.

For more information, view New Jersey’s Scientific Report on Climate Change.
NJDEP-Rutgers collaborative efforts toward developing an OA Action Plan

- Bureau of Climate Resilience Planning and Bureau of Marine Water Monitoring form NJCMP’s OA Team

- NJCMP OA Team Engages with Rutgers

- Goals of collaborative efforts:
  - Learn about OA Action Plan efforts in other coastal states (2020)
  - Identify knowledge gaps for State regarding OA science (2020)
  - Outline elements to use in future NJ OA Action Plan (2021-present)

- NJ joined the OA Alliance in April 2021
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Elements for future OA Action Plan

1. **Advance Scientific Understanding:** Improve the understanding of OA through support of research and observations
   - Development of an OA Statewide Monitoring Network

2. **Reduce Causes of OA:** Implement actions that will prevent or slow OA

3. **Build Adaptation and Resiliency:** Implement actions to assist ocean-dependent communities and industries, and marine ecosystems to adapt

4. **Expand Public Awareness:** Engage policy makers, scientists, and the public

5. **Build Sustained International Support:** Secure sustained funding, nationally and regionally, for ongoing, enhanced, and coordinated research and OA observation systems
Thanks!
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https://njclimateresourcecenter.rutgers.edu
(Research, Opportunities to address ocean acidification impacts in New Jersey)