

**COMMISSION TO STUDY the EFFECTS OF
COASTAL and OCEAN ACIDIFICATION and ITS
EXISTING and POTENTIAL EFFECTS on SPECIES
THAT ARE COMMERCIALY HARVESTED and
GROWN ALONG the MAINE COAST**

Proposed legislation in 2014, Chapter 110 Resolves (Law without
Governor's signature)

- Established in 2014 by the 126th Maine Legislature
- Members included
 - 2 state senators, 3 state representatives, two representatives of an environmental or community group, 3 commercial fishermen, 1 aquaculturist, and 3 scientists.
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- Identify mitigation strategies for coastal and ocean acidification
- Identify knowledge gaps in critical scientific data as it pertains to acidification in marine environments.
- Review work and studies presented at conferences and workshops held in New England or the Northeast region relating to acidification in marine environments
- Ascertain ways to strengthen existing scientific monitoring, research and analysis regarding causes and trends in coastal and ocean acidification
- Determine how to increase public awareness of coastal and ocean acidification
- Identify methods to help Maine mitigate, remediate and adapt to the effects of coastal and ocean acidification

- two subcommittees were established:
- the State of the Science subcommittee, charged with delving into the scientific literature and data pertaining to ocean acidification; and
- a subcommittee to review the Washington State Blue Ribbon Panel of Ocean Acidification report to determine the applicability of that panel's recommendations to the conditions in Maine.

State of Science Report

- Cold waters of the Gulf of Maine are more susceptible to ocean acidification than other regions in the United States because CO₂ is more soluble in cold water resulting in a faster rate of acidification than in warmer waters
- Contributors of open ocean acidification are
 - Atmospheric carbon dioxide (CO₂) (greatest contributor)
 - Nutrient and CO₂ runoff from land-based point and nonpoint sources are additional drivers of acidification
- Acidification will most heavily impact organisms that produce calcium carbonate hard parts
 - Clams, lobsters, shrimp, cold water coral

Species Response to Ocean Acidification

- Lobsters
 - 2 studies
 - One study found increased calcification of juvenile lobster at increased CO₂, the other found shells of certain stages of larvae were smaller at high CO₂.
 - Neither of these studies were conducted at water temperatures reflective of Maine
- Crabs
 - No studies on Jonah or Rock crabs
- Northern shrimp
 - Larval development time increases with high CO₂. Adults appear to be resilient
- Bivalves
 - Adults can handle high CO₂ while larvae are more sensitive to high CO₂
 - Impacts on other species are variable

Identified Six Overarching Short and Long-Term Goals

- Invest in Maine's ability to monitor and investigate the effects of ocean acidification
- Reduce emissions of carbon dioxide and fixed nitrogen
- Reduce local land-based nutrients and organic carbon contributions to ocean acidification by strengthening and augmenting existing pollution reduction efforts
- Increase Maine's capacity to mitigate, remediate and adapt to the impacts of ocean acidification
- Inform stakeholders, the public and decision makers about ocean acidification in Maine and empowering them to take action
- Maintain a sustainable and coordinated focus on ocean acidification

Invest in Maine's ability to monitor and investigate the effects of ocean acidification

- Recommendations:

1. Expand monitoring of ocean acidification to establish its natural variability and to detect trends in water chemistry and related biological responses.
2. Develop new tools with which to assess and understand acidification and its impacts in Maine waters.
3. Determine the causes of acidification in waters and sediments of Maine.
4. Identify the impacts of acidified waters and sediments on Maine's commercial species.

Reduce Emissions of Carbon Dioxide

1. Coordinate with international, national, and regional partners and encourage key leaders and policymakers to promote a comprehensive strategy to reduce carbon dioxide emissions.
2. Continue coordination and involvement with existing state and regional initiatives regarding the reduction of atmospheric carbon dioxide levels.
3. Implement actions at the state and local level that may help in reducing CO₂ emissions.

Reduce local land-based nutrients and organic carbon contributions to ocean acidification by strengthening and augmenting existing pollution reduction ports

1. Reduce nutrient loading and organic carbon from point source and nonpoint discharges causing or contributing to water quality problems
2. Assess the need for water quality criteria relevant to ocean acidification.
3. Enhance monitoring and create a database sufficient to support the development of regulatory and non-regulatory approaches to reduce and limit nutrients and organic carbon from sources that are contributing significantly to acidification of Maine's marine waters. Enhanced monitoring should begin in one or more pilot estuaries where impacts are presently occurring.
4. Establish public/private partnerships for additional data collection.
5. Ensure that state staff and other practitioners are working with the latest and best information and technology.
6. Investigate and implement incentive programs for pollution reduction.
7. Support and reinforce current planning efforts and programs that address the impacts of nutrients and organic carbon and variations in freshwater inputs into coastal areas.
8. Enhance education and outreach programs that provide landowners with information about best practices for reduction of nutrient pollution.

Increase Maine's Capacity to Mitigate, Remediate and Adapt to the Impacts of Ocean Acidification

1. Preserve and enhance marine vegetation including eelgrass beds, kelp and all native vegetation in bivalve areas and adjacent shorelines.
2. Encourage bivalve production to support healthy marine waters.
3. Spread shells in bivalve areas to remediate impacts of local acidification.
4. Increase the capacity of the fishing and aquaculture industries to adapt to ocean acidification.
5. Encourage the creation of research hatcheries.

Inform Stakeholders, the Public, and Decision Makers about Ocean Acidification in Maine and Empower them to Take Action

1. In addition to providing the Commission's report, the commission's key findings should be communicated to the Governor, Maine's legislative leaders, and Maine's Congressional delegation and the general public (including the press) in a series of briefings.
2. Continue efforts to increase the understanding of ocean acidification among key stakeholders, targeted audiences and local communities to help implement the commission's recommendations.
3. Enhance the existing communication network of engaged stakeholders, state agency representatives and the research community.
4. Develop, adapt and use curricula on ocean acidification in K-12 schools and higher education, and increase interdisciplinary university programs to equip young leaders with the skills to find solutions to complex multidisciplinary problems such as ocean acidification.

Maintain a Sustainable and Coordinated Focus on Ocean Acidification

Create an on-going ocean acidification commission.

Proposed Legislation

- The commission strongly believes that an ongoing entity must be created to continue the work of this commission. Ocean acidification is a long-term issue that will evolve in ways this commission cannot foresee or have the ability to address during its limited existence. The creation of a permanent ocean acidification commission is paramount to protecting our commercially valuable species from the deleterious effects of acidification.