

Summary of 11292018 Winter Meeting of the Maine Ocean and Coastal Acidification Partnership and the Coastal Caucus

On Thursday, November 29th, more than 20 legislators from Maine's Coastal Caucus joined members of Maine's Ocean and Coastal Acidification (MOCA) Partnership¹ at the Maine State House to discuss advances in ocean acidification science and policy since the [2015 Maine Ocean Acidification Study Commission Report](#) and how to shape the future of such efforts. The half day meeting included a representative from Governor-Elect Mills' transition team, staff from the executive branch including employees of the Departments of Marine Resources and Environmental Protection, and numerous other stakeholders. A list of attendees is appended to this summary.

The meeting commenced with an overview of Maine's efforts to address ocean and coastal acidification (OCA). The presentation noted that: Maine passed a bill in 2014 to create a legislative OCA study commission. That commission sunset in 2015, after it presented a report and recommendations to the legislature. Although the study commission recommended that Maine create an ongoing commission to coordinate OCA research and make policy recommendations, a bill to create such a commission failed to gain executive branch support.

To fill the void, a group of dedicated entities and people created a voluntary network called the Maine Ocean and Coastal Acidification (MOCA) Partnership. Since 2015, research to understand, mitigate, and adapt to OCA has advanced and been shared through MOCA's grassroots community of more than 200 individuals representing stakeholders across sectors.

MOCA has held a number of events including six symposia and a webinar. MOCA also has maintained an email list serve and sent periodic newsletters, notices of relevant workshops, and other updates to its members. It has struggled with lack of funding and inability to undertake the full range of actions needed to better understand and address OCA.

Following this introduction to MOCA, Dr. Joe Salisbury, a leader in OCA research in the Gulf of Maine, provided an overview of the offshore and onshore drivers that lead to acidification. He shared what the scientific community has learned about OCA since the 2015 Maine Commission report.

Globally, we have a very good assessment of the amount of fuel that we burn. We understand that about 50 % of it remains in the atmosphere while a quarter has been absorbed by terrestrial systems and a quarter has been absorbed by marine systems. Our record of CO₂ since 1958 is extremely accurate and precise. Despite marginal uncertainty with carbon dioxide as the cause of global warming, there is no uncertainty that CO₂ is the driver of chemistry change in the oceans.

In simplistic terms, ocean acidification occurs when excess carbon dioxide from the atmosphere is deposited in the ocean, where it mixes with sea water to form carbonic acid. This chemical change lowers pH and alters water chemistry reducing the availability of calcium carbonate needed by organisms to build healthy shells. Coastal acidification occurs when nutrients from land sources are carried by stormwater runoff to coastal waters, where they fertilize algal

¹ For more information, go to <https://www.seagrant.umaine.edu/extension/maine-ocean-and-coastal-acidification-partnership>.

blooms. As the blooms die and decompose, they release carbon dioxide, which mixes with sea water to form carbonic acid. Maine's nearshore shellfish experience impacts of both ocean and coastal acidification.

The Gulf of Maine is influenced primarily by water inflows from the Northeast channel and several smaller inflows. A comparatively small amount of freshwater comes off the land but it can be very important for coastal acidification processes and for local industries. Freshwater along the coast does not have the buffering capacity of the saltier open ocean. It cannot resist acidification as well as the open ocean. Data from the Casco Bay buoy provides evidence that acidification is occurring during rain events (onshore sources) and during ocean pulses (offshore sources) in Maine's nearshore environment.

The exact effects of OCA on marine biota are not cumulatively understood, but are mostly negative. The biological effects for some species are preliminarily understood. For example, coral reefs in the Gulf of Maine are expected to suffer from increased OCA. Pteropods already have a difficult time making their shells secondary to OCA, and hatcheries have to buffer the water being introduced into aquaria to produce healthy spat.

The complexities of the food webs in the Gulf of Maine complicate our ability to forecast the large-scale ecological effects of OCA. The organisms believed to be most impacted by OCA exist largely at the base of the food web. Since 2015 research has evolved so that we now understand that:

- Decreased pH negatively affects lobster molting.
- OCA contributes to decreased lobster growth and increased shell disease.
- PCO₂ (the partial pressure of carbon dioxide in marine water and an indicator of OCA) is linked with the larval development of lobster. Warming water drives physiology and pCO₂ influences behavior.
- Under a highest impact scenario, OCA is projected to decrease scallop populations by 13% by the end of century.

There are multiple important opportunities to be taken at this time. Maine should invest in more long term monitoring. At present, nongovernmental researchers have conducted shorter term collaborative efforts to advance our knowledge of OCA. Those efforts have waxed and waned with the availability and duration of funding. Coordinated and consistently funded research efforts will greatly advance our understanding and ability to shape policies to address OCA. Moreover these efforts could be expanded to address other synergistic impacts of climate change on Maine's marine species.

Reducing greenhouse gasses is central to the challenge of OCA. The success of the Northeast's Regional Greenhouse Gas Initiative (RGGI) offers an optimistic view for Maine's ability to act on carbon emission reductions. Since its inauguration, RGGI alone has been responsible for reducing an estimated 1.5% of the nation's CO₂ emissions. (Maine now has an opportunity to participate in and help shape regional policy to reduce greenhouse gas emissions from the transportation sector, our state's largest source of such gases.)

The meeting next focused on a brief overview of Maine's work in a regional and national context. We were once a leader but are falling behind by not having an on-going commission or consistent funding to address OCA.

The meeting concluded with a facilitated discussion of whether MOCA's work should be formalized into an ongoing commission and whether MOCA should develop an action plan. The consensus of the meeting participants was that MOCA's or Maine's focus should shift from solely examining the impacts of OCA on marine organisms, to examining more broadly the synergistic impacts of climate change on Maine's marine organisms. The legislators who participated requested that MOCA better define the composition of and vision for an ongoing commission, including its primary goals with respect to better understanding and addressing the broader impacts of climate change, e.g. increased predation, increased shell disease, and changing ranges for species in addition to OCA.

With respect to an action plan, meeting participants recommended that: MOCA clarify potential leadership roles for this and ongoing work. MOCA could look to models like other existing permanent panels that report back to the legislature. The action plan also should contemplate various institutional strengths so that science, outreach, and policy are developed effectively. Given the gap in time from the 2015 OCA Study Commission Report to the present, participants further identified a need to update the 2015 study commission report.

MOCA intends to follow up on these recommendations by: working with Reps. Blume and Devin to submit legislation that would authorize an ongoing commission to address the impacts of climate change on Maine's marine species; and by working to develop an Action Plan in calendar year 2019 that can inform the work of any new commission and bridge the gap between MOCA efforts and any ongoing formalized efforts to advance our understanding and ability to address the impacts of climate change on Maine's valuable marine resources.