

A Report on Washington State's Response to Ocean Acidification for Marine Managers



Eric Swenson

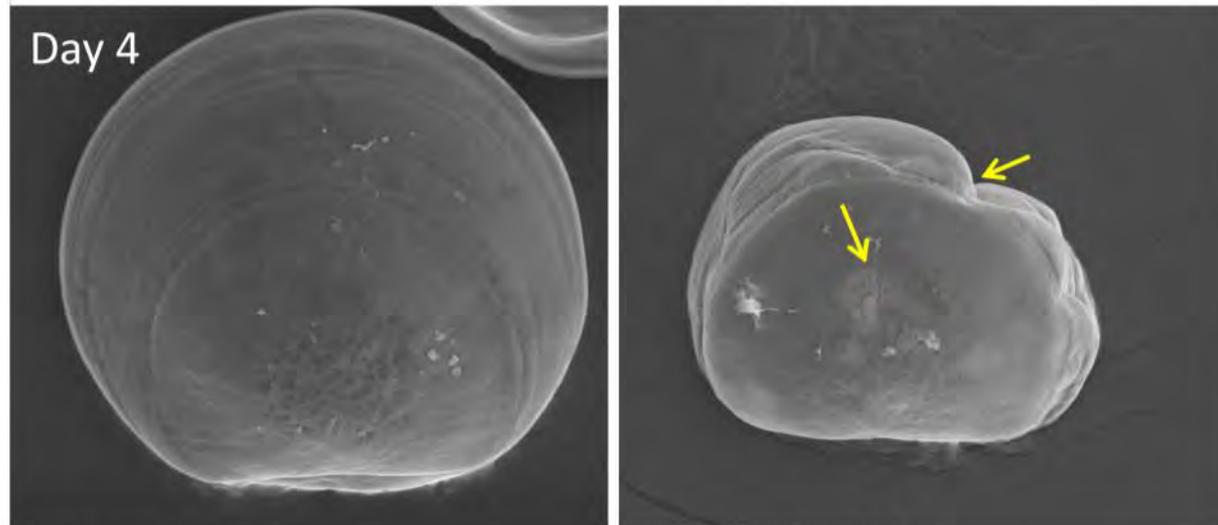
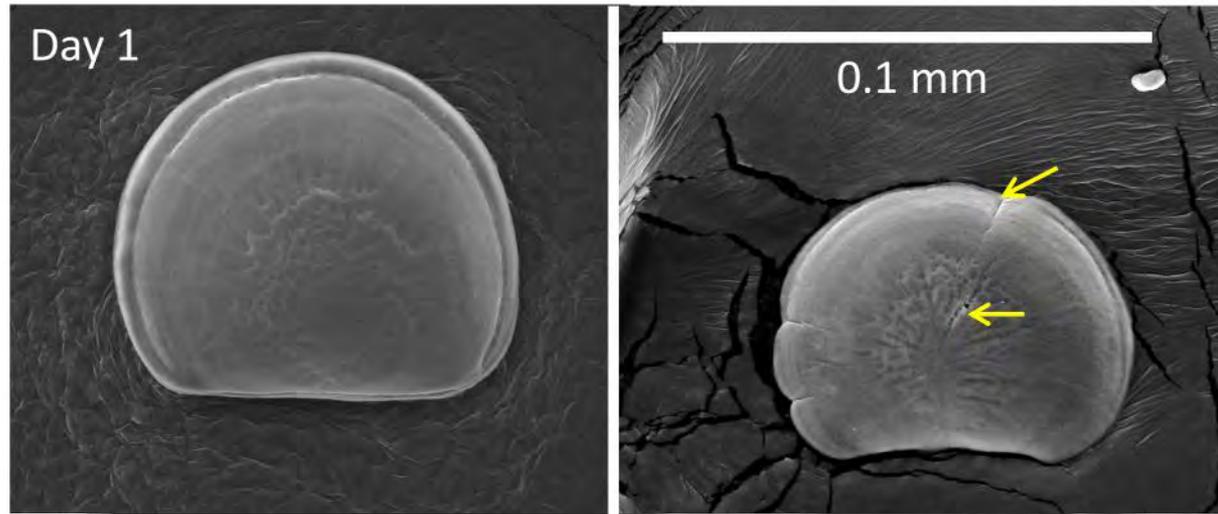
**Communications and Outreach Director
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*A joint project of the National Fisheries Conservation Center
and the Sustainable Fisheries Partnership*

Marine Managers Workshop

Friday Harbor, Washington – February 27, 2013

Pacific oyster larvae spawned in favorable (left) and unfavorable (right) seawater conditions



Ω Aragonite = 1.64
pCO₂ = 403 ppm
pH (total) = 8.00

Ω Aragonite = 0.47
pCO₂ = 1418 ppm
pH (total) = 7.49

Oyster Seed Crisis

70-80% losses of larvae in Whiskey Creek and Taylor Shellfish hatcheries, 2007-09. Whiskey Creek on Netarts Bay, Oregon, which produces 75% of oyster larvae for West Coast growers, was ready to close before acidification was found to be the cause of the die offs.



The Canary Survives

Extensive monitoring of water pH

Adjusted protocols for time and depth of intake

Research and testing of mitigation and adaptation methods, such as buffering

2011 production 75-80% at Whiskey Creek, highest ever at Taylor



News from the Frontlines

The Seattle Times

June 21, 2012

Oyster grower sounds alarm, starts hatchery in Hawaii



Willapa Bay yields around 20% of all the shellfish harvested in the United States. One producer has removed his larvae-growing operations from state waters, placing them in Hawaii where upwelling is not a problem.

What's at Stake for Washington's Economy?



The most productive commercial shellfish industry on the West Coast

- Washington's shellfish industry generates \$270 million annually, and directly and indirectly supports 3,200 jobs.
- Annual sales of farmed shellfish from Washington account for almost 85% of U.S. West Coast sales (including Alaska).

What's at Stake for Washington's Economy?



Valuable wild and recreational fisheries

- Impacts to marine food webs could affect Washington's seafood industry, which generates over 42,000 jobs in Washington and contributes at least \$1.7 billion to gross state product.
- Recreational oyster and clam harvesters contribute more than \$27 million annually to coastal economies.

What's at Stake for Washington's Tribes?



Continued identity and cultural survival of Washington's coastal tribes

- Washington tribes depend upon shellfish for food, income, and connection to their cultural heritage.

Developing the Response: The Blue Ribbon Panel on Ocean Acidification

- Appointed by Governor Christine Gregoire in February 2012.
- A first-of-a-kind comprehensive state-level effort to address ocean acidification.
- Charged with reviewing the best available science, and producing a set of recommendations to guide Washington's response.
- Scientists, decision makers, industry stakeholders, tribal representatives, and conservation community representatives worked together to produce a comprehensive set of recommendations.



Gov. Gregoire and Bill Dewey of Taylor Shellfish Company discuss growing and harvesting techniques for oysters in the tide flats in Samish Bay.

Washington State Panel Reports

NOAA OAR Special Report

*Washington Shellfish Initiative
Blue Ribbon Panel on Ocean Acidification*

Scientific Summary of Ocean Acidification in Washington State Marine Waters



*Ocean
Editors*

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Advance Copy – November 2012

Washington State Blue Ribbon Panel on Ocean Acidification



Ocean Acidification: From Knowledge to Action

Washington State's Strategic Response



November 2012

Panel Recommendations

42 recommendations, including 18 *Key Early Actions*, that will:

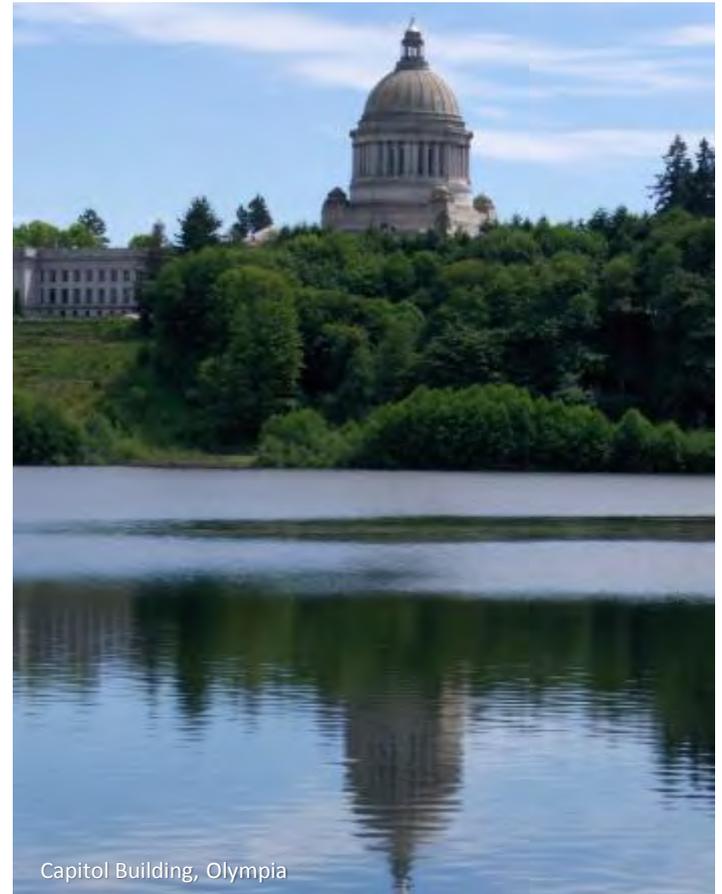
1. Address the root cause of acidification by reducing CO₂ emissions;
2. Reduce local land-based pollutants that worsen acidification;
3. Foster adaptation and remediation to protect the shellfish industry and marine ecosystems;



Panel Recommendations – cont'd

42 recommendations, including 18 *Key Early Actions*, that will:

4. Increase research and monitoring of acidification in state waters;
5. Inform, educate, and engage the public, stakeholders, and decision makers in responding to ocean acidification; and
6. **Maintain a sustained and coordinated focus on ocean acidification.**



Capitol Building, Olympia

Governor's Response: *Executive Order 12-07*

Directs the Department of Ecology and other cabinet agencies to:

- Advocate for reductions in emissions of carbon dioxide;
- Implement the recommendations of the Blue Ribbon Panel;
- Work with the University of Washington and others to coordinate and conduct scientific investigations and science/policy collaborations;
- Request that the EPA assess water quality criteria relevant to ocean acidification;
- Increase public understanding of ocean acidification and its consequences.



Signing Exec Order 12-07, Nov 27, 2012

Governor's Response: *Proposed Funding*

\$3.31 million in proposed 2013-2015 biennial budget to implement the Panel's key early actions.

Funds will go to UW (\$1.8m), the Washington Department of Ecology (\$980k), and the Washington Department of Natural Resources (\$510k)



Shucked Pacific oyster

Governor's Response: *OA Impacts and Adaptation Center*

Proposes Creation of a new **Ocean Acidification Center** at the University of Washington. The Center will:

- Advance the Panel's research and monitoring recommendations;
- Lead and foster ongoing decision-relevant science regarding ocean acidification;
- Enhance and maintain research coordination and collaboration; and
- Engage a range of stakeholders



Final Tips/Questions for Marine Managers

Stock assessments

Review model assumptions, especially with respect to natural mortality. Fundamental mineral building blocks of marine ecosystems are becoming progressively less available due to changing marine chemistry. Under this kind of change, do standard density-dependence and competition assumptions still hold? Is it still safe to assume that rising natural mortality will produce rising harvestable yield?

Monitoring to inform management

Both in harvest management and in MPA management, changes in marine carbonate chemistry are beginning to alter foundations of productivity and habitat function. Resource and reserve managers must begin to learn the skills to monitor this chemistry—which very few of them possess—or build partnerships with people who can do it (We can help; so can the OOS system, NOAA, and the CCAN partners). This kind of monitoring isn't cheap. Wherever possible, resource should learn from existing monitoring and piggyback their own inquiries on monitoring systems that are already deployed. We will need to maximize bang for buck from these investments. We will also need to expand them, but this expansion will need to be judicious and strategically focused.

Final Tips/Questions for Marine Managers

Fencing a changing sea

Do we need to retool spatial strategies and social frameworks to manage MPAs?

Today's reserves and MPAs are designed, monitored, and managed mainly to reduce harvest stress (occasionally to reduce habitat or pollution stress). But if only one stress is restricted (usually harvest), is that the best way to respond to a future of prolonged, multi-vector environmental change?

Could spatial conservation tools be designed to more effectively protect their intended organisms in a changing ocean? Can conventional concepts about protection still work, if the habitat becomes unfit to support the intended species (e.g. due to OA, warming, altered hydrologic regimes, sea rise)?

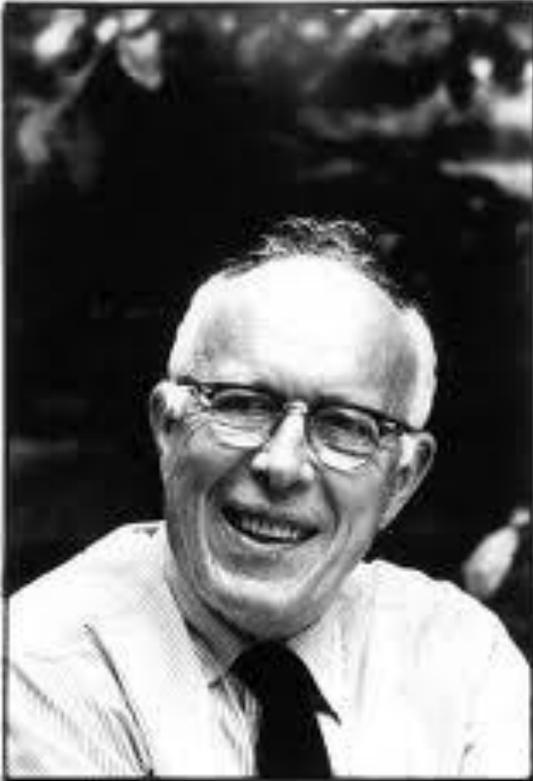
Warming has already prompted some highly valued marine species to alter their range by hundreds of miles. Can MPAs protect species that move away? Could a revised approach to spatial conservation—integrating terrestrial and marine policies perhaps—help to protect shallow subtidal or intertidal species in areas that may experience rapid sea rise?

And finally, consider the social dimension of these changes. If harvest is the only stress we halt, but other changes are allowed to erode resources from the bottom up, will coastal stakeholders lose their incentive to comply with MPA rules? Why will they want to make spatial conservation work? Can management maintain its social license?

Listen to the Canary!



Promote Success



Since there are countless ways to go wrong but only a very few ways to do right, our best chance to deal successfully with our contemporary problems and those of the future is to learn from the success stories of our times.

-Rene Dubos

Key Element: Monitoring

You can't dodge what you don't see



Four Personal Reasons I Work on Ocean Acidification



For More Information...

Washington Department of Ecology :
<http://www.ecy.wa.gov/water/marine/oceanacidification.html>

NOAA Pacific Marine Environmental Laboratory:
<http://www.pmel.noaa.gov/co2/story/Ocean+Acidification>

Please Stay in Contact

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