# Monitoring and Adaptation to Ocean Acidification in the Shellfish Industry

Science information sheet

WASHINGTON OCEAN ACIDIFICATION CENTER
UNIVERSITY of WASHINGTON
MARINE RESOURCES ADVISORY COUNCIL

Ocean acidification and the corrosive water conditions it creates can reduce survival and overall growth of juvenile shellfish. In an effort to inform managers and growers in the commercial shellfish industry about seawater conditions, the Washington State Legislature provided $150,000 to the Washington Ocean Acidification Center (WOAC) to direct monitoring efforts at six existing shellfish hatcheries (Washington State Blue Ribbon Panel Action 6.2.1). The Legislature also provided $100,000 to investigate and develop commercial scale water treatment methods to protect shellfish from corrosive waters (Washington State Blue Ribbon Panel Action 6.2.3).

### How has Washington's shellfish industry helped monitor ocean acidification?

WOAC has worked with Washington shellfish growers through the Pacific Coast Shellfish Growers Association to maintain and enhance ongoing ocean acidification monitoring at six shellfish hatcheries and growing sites. Their monitoring efforts have provided new information for managers and researchers alike. Evidence shows that water chemistry in bays and estuaries each summer already falls well below the optimal growing conditions of sensitive marine species. Data collection at hatchery sites also reveals that there is a great deal of local variability in water chemistry. Understanding this variability and how corrosive conditions can be particularly acute in coastal areas is a key concern for growers in the Pacific Northwest.

Hatchery data collected through these efforts is uploaded immediately to the Northwest Association of Networked Ocean Observing Systems (NANOOS) web data portal and is accessible on-line and by smartphones at no cost to Washington state.

## Continued monitoring and adaptation research for shellfish growers is needed in 2015-17

Funds are needed to sustain current monitoring efforts specific to shellfish sites. These data help shellfish growers make day-to-day management decisions for their businesses, and in the long term, will help the shellfish industry successfully adapt to changing marine conditions. The monitoring efforts at shellfish sites also constitute an important component of the Washington Integrated Ocean Acidification Monitoring Network, adding to a growing knowledge of water chemistry in our economically important coastal bays. Continued testing to scale up water treatment methods is also needed to ensure the shellfish industry can adapt to changing water quality.

*Benoit Eudeline of Taylor Shellfish Hatchery using real-time monitoring equipment that measures pH and water chemistry of seawater.*

## What you need to know

- $250,000 provided by State Legislature to fund:
  - Ocean acidification monitoring at six shellfish hatcheries
  - Industry research on water treatment methods for adaptation
- WOAC leverages $150,000 federal NOAA investment by using the NANOOS web portal to share hatchery data
- WOAC coordination and support builds on $100,000 in industry research on adaptation methods

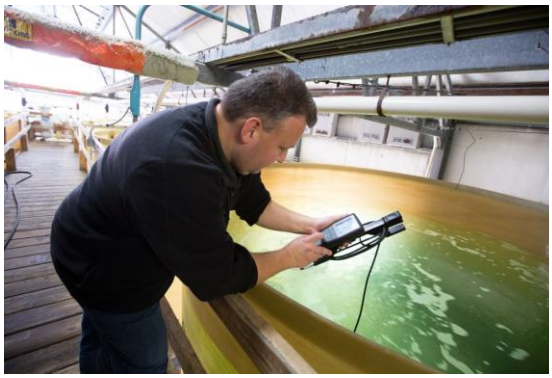
The real-time information can be used immediately to inform management practices at other commercial hatcheries, and to guide decisions by resource managers responsible for maintaining a variety of shellfish species important to the region. The result is improved shellfish production across Washington.

**Six shellfish monitoring sites at:**

- Taylor Shellfish Hatchery (Dabob Bay)
- Lummi Indian Nation Hatchery (near Bellingham)
- Grow-out sites in Willapa Bay (Tokeland)
- Ekone Oyster Company (Bay Center)
- Jolly Roger Oyster Company (Nahcotta)
- Whiskey Creek Shellfish Hatchery (Netarts Bay, OR; supported by funds through the Oregon State Legislature)

### How is the shellfish industry beginning to adapt to changing conditions?

WOAC also coordinated and funded investigations by hatchery managers on the use of water treatment systems to improve shellfish production under corrosive water conditions. Initial development of water treatment systems has demonstrated early success. Small-scale systems in place at the Whiskey Creek hatchery have proven effective at maintaining healthy conditions in growing tanks and have improved survival and growth among growing shellfish. Another pilot system being tested by Taylor Shellfish has shown increased shellfish survival and growth. Challenges remain in scaling up these systems to operate at commercial scales, however. Commercial-scale systems already in place at Whiskey Creek have had limited success so far.



*Eudeline monitoring oxygen concentration in growing tanks at the hatchery to investigating water treatment methods.*

### How has the state investment been leveraged?

Much of the equipment being used in this monitoring project was secured in 2010-2012 through funding from the National Oceanic and Atmospheric Administration (NOAA), with the direct support of Senator Maria Cantwell's office. Additionally, monitoring systems in place at Whiskey Creek, Taylor Shellfish, and Willapa Bay are provided by Oregon State University, leveraging investments by NOAA and U.S. Integrated Ocean Observing System (US IOOS). Staff at Taylor Shellfish and Pacific Shellfish Institute maintain the monitoring equipment and collect samples with assistance from a University of Washington scientist. The data is shared on the NANOOS database at no cost to WOAC, leveraging over $150,000 in federal NOAA investment.

Each hatchery has dedicated more than $100,000 in private funds for equipment and research toward developing water treatment adaptation systems. The additional funding provided through WOAC has allowed hatcheries to maintain and enhance their water treatment infrastructure and to test new treatment technologies that could potentially inform adaptation throughout Washington's shellfish industry.

### How do these efforts help the shellfish industry?

Ocean acidification has already had a significant economic impact on commercial shellfish production in the Pacific Northwest. Shellfish hatcheries have used real-time data collected at these monitoring stations to improve oyster production in the face of challenging and highly variable water conditions in coastal bays. Coastal economies in Washington State and across the Pacific Northwest benefit from these efforts as more oyster production translates directly into more jobs in coastal communities. As ocean acidification intensifies over time, effective water treatment systems are needed to adapt and offset increasingly corrosive conditions.

## For more information

See the Washington Ocean Acidification Center website:
http://coenv.washington.edu/research/major-initiatives/ocean-acidification/

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