WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

Acidification Nearshore Monitoring Network

How do ocean acidification and warming impact nearshore habitats?

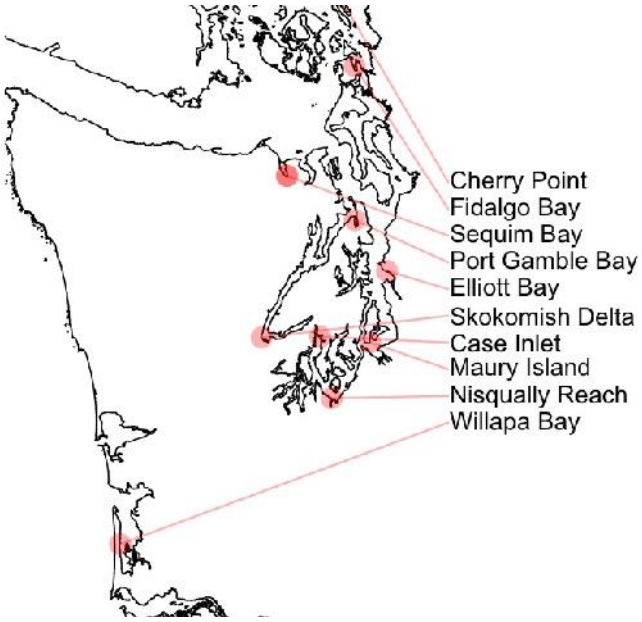
Washington State has led on ocean acidification through scientific research and policy response. DNR established ANEMONE in 2015 as part of these efforts, with three central goals:

- to measure the progress of acidification and warming via high-quality environmental data
- to experimentally test practical management options that enhance ecosystem resilience
- to increase public engagement with ocean acidification and warming issues

ANEMONE is designed to evaluate the effects of eelgrass on local acidity: at each site, scientific instruments measure water quality in and outside of eelgrass. The geographic scope and consistent design of sites provide a foundation for replicated field experiments that address management needs and pressing scientific questions.

ANEMONE complements laboratory science by bringing acidification experiments into the field, and augments existing water quality monitoring by extending observations into nearshore habitats, where natural resources are concentrated.

ANEMONE instruments measure water quality in eelgrass.



ANEMONE consists of ten sites, with stations in eelgrass and in unvegetated habitat at each site.

Why does this matter to DNR?

Ocean acidification and warming are global problems with local impacts. DNR needs to understand when these trends become detectable on state-owned aquatic lands, and what options are available to reduce negative impacts. ANEMONE aims to meet these needs.

ANEMONE data have highlighted regional differences across Washington State: sites vary in acidity, temperature, and other parameters. These differences could translate into vulnerability or resilience in the face of environmental change. Building on prior DNR research, ANEMONE has improved our understanding of eelgrass effects on local acidity: over longer periods, eelgrass appears to have no consistent effect.

Project Outcomes

Diverse collaborators have worked with DNR on projects to test whether oyster shell can improve local acidity, to detect acidification and warming stress in shellfish populations, and to explore how shellfish might benefit from association with eelgrass.

Since 2015, ANEMONE has collected almost 20,000,000 water quality observations. ANEMONE has partnered with dozens of 'Site Guardians,' who volunteer to maintain scientific instruments and collect biological data. The annual ANEMONE report summarizes data, experimental outcomes, and more. It can be found at: dnr.wa.gov/publications/aqr_aamt_horwith_state_of_ANEMONE_2019.pdf.

Future Opportunities

Nearshore water quality is highly variable, and the detection of long-term change requires years of data. With four years of observations at some sites, ANEMONE can now begin to explore whether global trends are evident on state-owned aquatic lands.

DNR is concerned about acidification and warming impacts on the geoduck fishery. Future work will use ANEMONE data to assess the status and vulnerability of wild geoduck. DNR will also continue to collaborate with interested partners including tribes, ports, and universities.

For more information

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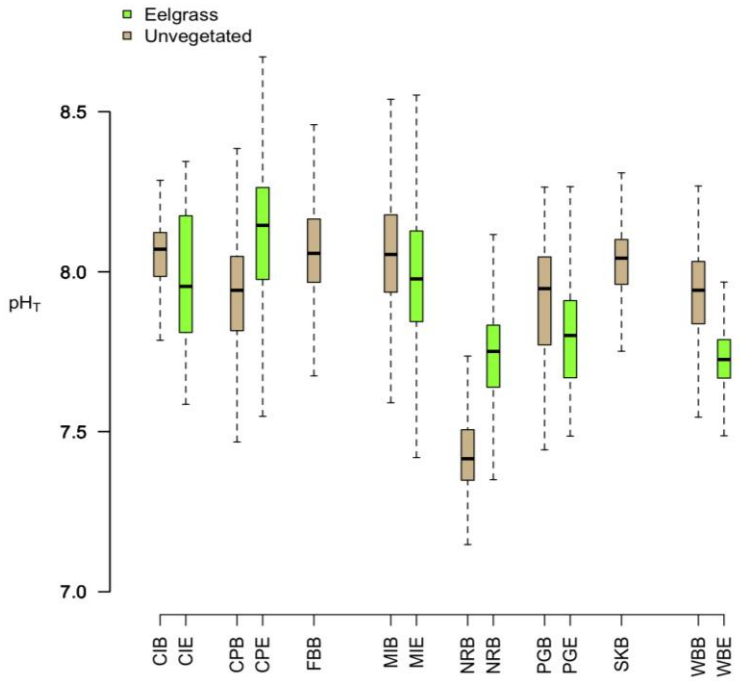

Acidity (pH) at eight ANEMONE sites in the summer of 2018. Refer to the map on previous page for site name abbreviations (e.g. CI = Case Inlet).

Project Outputs

ANEMONE has generated a growing number of peer-reviewed publications. The latest include:

- Spencer LH, Venkataraman YR, Crim R, Ryan S, Horwith MJ, Roberts SB, (accepted, Ecol Appl), Carry-over effects of temperature and pCO2 in multiple Olympia oyster populations
- Lowe AT, Kobelt J, Horwith MJ, Ruesink JL, 2018, Ability of eelgrass to alter oyster growth and physiology is spatially limited and offset by increasing predation risk, Estuaries Coasts, doi: 10.1007/s12237-018-00488-9
- Grenier CM, Klinger T, Ruesink JL, Barber JS, Horwith MJ, 2018, Habitat effects of macrophytes and shell on carbonate chemistry and juvenile clam recruitment, survival, and growth, J Mar Biol Ecol, doi: 10.1016/j.jembe.2018.08.006

Project Participants