WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

Ocean acidification at habitat boundaries

Does eelgrass improve water quality in a 'halo' beyond the meadow edge?

In 2014, DNR and UW found that water passing through eelgrass decreased in acidity during summer daylight hours, and in summer 2016 found that Pacific and Olympia oysters grew faster inside of eelgrass. Faster growth in eelgrass could be due to differences in acidity and/or other factors. To understand whether wild shellfish and aquaculture can benefit from proximity to eelgrass, DNR and UW set out to assess whether eelgrass has a 'halo' of beneficial effect beyond the meadow edge.

DNR selected five sites from the Acidification Nearshore Monitoring Network, and transplanted juvenile Pacific oysters and geoducks to each site from a hatchery, with animals inside and outside of eelgrass and at intervals between 1m and 15m from the meadow edge. DNR and UW also collected samples at these points to analyze DNA in the water. DNR deployed scientific instruments for two weeks at each site to understand how water quality changes with proximity to the meadow edge. After 80 days, DNR retrieved Pacific oysters and geoducks, and measured changes in size and shell mass.

Differences in water quality could spill across habitat boundaries, where eelgrass meets unvegetated areas.

Scientific instruments, Pacific oysters and geoducks deployed within the potential halo of a Willapa Bay eelgrass meadow.

Why does this matter to DNR?

As the steward of aquatic vegetation and shellfish on state-owned aquatic lands, DNR is interested in how intact natural resources mutually reinforce one another. If eelgrass photosynthesis decreases acidity in a halo beyond the meadow edge, shellfish might benefit, and if shellfish feeding removes particulates and improves light conditions, eelgrass might benefit. If so, habitat diversity may enhance nearshore ecosystem resilience.

For more information

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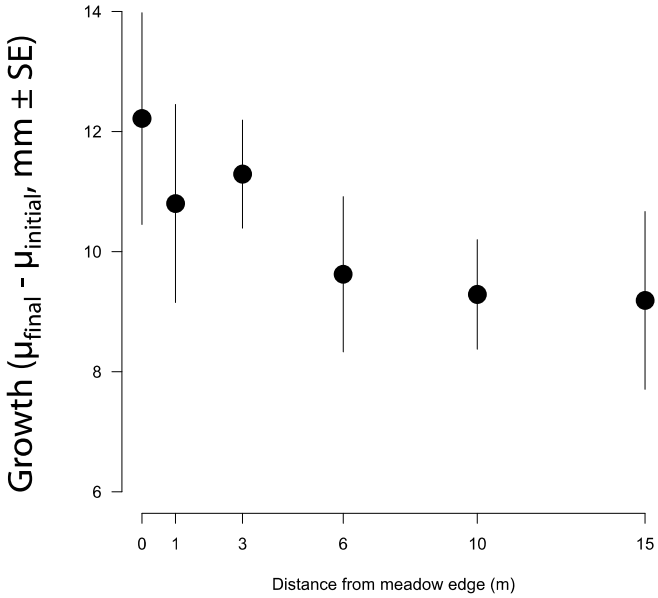
Project Outcomes

Geoducks showed no response to the potential halo of eelgrass – they grew equally well inside, outside, and nearby the meadow.

Pacific oysters grew faster inside of eelgrass, and in some cases, proximity to eelgrass also appeared to improve growth, providing evidence for a halo effect.

On average, proximity to eelgrass did not seem to affect acidity, and water quality within the potential halo was highly variable. During specific windows of tidal motion, clear gradients in acidity and oxygen were apparent across habitat boundaries.

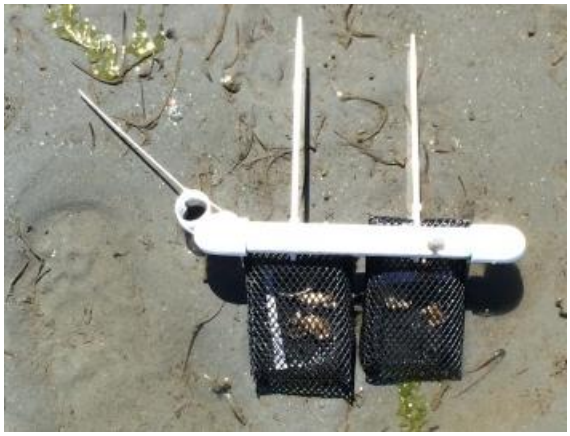


Pacific oyster growth within the potential halo of eelgrass in the cross-shore direction. Oysters at 0m were at least 10m from any given edge. Oysters were exposed to environmental conditions for 80 days at five ANEMONE sites, with shells measured before and after.

Future Opportunities

DNR and UW are analyzing DNA from 2017 water samples to understand how proximity to eelgrass affects biological communities, and test whether planktonic shell-building animals congregate within or near meadows.

DNR has also moved forward with experiments to test whether faster shellfish growth in eelgrass is due to factors besides acidity, including food availability, water temperature, and harmful bacteria.



Pacific oysters 15m from the eelgrass meadow edge, protected from predators by mesh

Project Outputs

Results presented at:

- Fidalgo Bay Science Symposium, Anacortes, WA 2018
- Evergreen State College, Olympia, WA 2018
- Portland State University, Portland, OR 2018
- NW Straits Initiative Conference, Bellingham, WA 2017
- Northwest Climate Conference, Tacoma, WA 2017

This project produced unanticipated findings on other topics, now under review for publication:

- Jacobs-Palmer E, Gallego R, Ramón-Laca A, Kunselman E, Cribari K, Horwith M, Kelly RP, (in revision, Front Mar Sci), Seagrass mediates microalgal community structure at a distance

Project Participants

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