

Update Report

Period: 2/1/2014 - 1/31/2015

Project: R/HCE-6 - Understanding Potential Impacts of Seasonal Hypoxia Along the Quinault Reservation Coast

STUDENTS SUPPORTED

No Students Reported This Period

CONFERENCES / PRESENTATIONS

Washington Coast Marine Resource Committee (MRC) Summit meeting. Gathering of members from coastal MRCs. Presentation by project PI to group. Description of hypoxia events, potential impacts and study design., public/profession presentation, 30 attendees, 2014-10-25

Olympic Coast National Marine Sanctuary - Sanctuary Advisory Council meeting, Aberdeen, WA.

Presentation by project PI accompanied by Taholah School students and teacher that participated in project., public/profession presentation, 30 attendees, 2014-09-26

ADDITIONAL METRICS

P-12 Students

Reached: 14

Grade 10-12 students that have worked directly with the Sea Grant project by conducting regular water quality sampling, quality checking data, and presenting graphic depictions for interpretation by students, teachers and other project participants. Many more students were able to see presentations of the project and the data gathered by the students in a display in the school hall.

Participants in Informal

Education Programs: 0

Acres of coastal habitat protected, enhanced or restored: 0

P-12 Educators

Trained: 3

Principal, Vice-principal and Natural Science Instructor were essential to incorporating the Sea Grant project into the Taholah School natural sciences curriculum and allowing participation of the students.

Volunteer Hours: 0

Resource Managers who use Ecosystem-Based Approaches to Management: 0

Annual Clean Marina Program - certifications: 0

HACCP - Number of people with new certifications: 0

ECONOMIC IMPACTS

Description	Patents	Market Impacts (\$)	Non-Market Impacts (\$)	Businesses Created	Businesses Retained	Jobs Created	Jobs Retained
Not applicable at this stage of the project. It is anticipated that the monitoring system and data produced by this project will aid management of Pacific razor clams and nearshore ecosystem services in the future.	0	0	0	0	0	0	0

SEA GRANT PRODUCTS

Description	Developed?	Used?	ELWD?	Number of Managers	Names of Managers
Water quality monitoring protocol for use by high school students on the Washington coast.	Yes	Yes	Yes	0	

Nearshore water quality monitoring system on the Washington coast.	Yes	No	No	0	N/A
--	-----	----	----	---	-----

HAZARD RESILIENCE IN COASTAL COMMUNITIES

No Communities Reported This Period

ADDITIONAL MEASURES

Number of stakeholders modifying practices: 1

Sustainable Coastal Development

of coastal communities: 0

One Quinault fisher has worked with the project to-date and has modified his fishing practice to deploy, recover, and download data from the nearshore monitoring system. This project is now the interest of this fisherman and data developed by it in the future is likely to affect how he fishes, where and when.

2 more fishers will join the first in Year 2 following training.

PARTNERS

Partner Name: Grays Harbor County Marine Resources Committee

Partner Name: Northwest Association of Networked Ocean Observing Systems (NANOOS)

Partner Name: Olympic Coast National Marine Sanctuary (US DOC, NOAA, NOS, ONMS)

Partner Name: Quinault Indian Nation

Partner Name: Taholah K-12 School, type: Academic Institution, scale: Tribal

IMPACTS AND ACCOMPLISHMENTS

Title: **Washington Sea Grant supports the Quinault Indian Nation's creation of an observing system to gauge hypoxia effects on razor clams and other tribal marine resources**

Type: accomplishment

Description:

Relevance: Low dissolved oxygen, or hypoxia, is a growing problem in marine systems, with hypoxic events increasing in frequency, duration, and impact

worldwide. Hypoxia has been documented off Washington's coast for many years. Direct evidence of ecosystem impacts came in summer 2006 when thousands of dead fishes and crabs washed ashore at the Quinault Indian Nation reservation. Given tribal dependence on marine harvests for spiritual and economic sustenance, Quinault resource managers have placed high priority on a scientifically rigorous observation system to monitor the timing and severity of hypoxic events.

Response: With Washington Sea Grant support, tribal managers are working with the Quinault fishing fleet to design, install, and maintain a system to document hypoxia and inform marine resource managers overseeing Pacific razor clams, Dungeness crab, and other species. The system uses retrofitted crab pots as observation platforms, and fishermen will routinely service the pots as part of their daily operations.

Results: Funding and fabrication delays prevented system deployment before the 2014 hypoxia season. Instead, researchers worked with the Taholah Tribal School to collect shore-based data from two beach and two estuarine sites. Student scientists tracked several parameters (such as temperature, salinity, upwelling), confirmed that estuarine samples are more accurate than beach samples, and suggested system modifications to improve future sampling.

Recap:

Recap: Washington Sea Grant supports the Quinault Indian Nation's innovative coastal monitoring system, which uses crab pots as observation platforms, relies on fishermen for maintenance, and engages tribal high school students in valuable shore-based sampling.

Comments:

Primary Focus Area: HCE
Secondary Focus Area: SFA, OLWD
Associated Goals: Ocean and coastal resources are managed using ecosystem-based approaches. (HCE)
Fisheries are safe, responsibly managed, and economically and culturally vibrant. (SFA)
The future workforce is skilled in disciplines critical to coastal and ocean economies and ecosystem health. (OLWD)

Partners:

Grays Harbor County Marine Resources Committee
Northwest Association of Networked Ocean Observing Systems (NANOOS)
Olympic Coast National Marine Sanctuary (US DOC, NOAA, NOS, ONMS)
Quinault Indian Nation
Taholah K-12 School
Related Partners: Taholah K-12 School, Quinault Indian Nation, Olympic Coast National Marine Sanctuary (US DOC, NOAA, NOS, ONMS), Northwest Association of Networked Ocean Observing Systems (NANOOS)

PUBLICATIONS

No Publications Reported This Period

OTHER DOCUMENTS

No Documents Reported This Period

LEVERAGED FUNDS

No Leveraged Funds Reported This Period

UPDATE NARRATIVE

Uploaded File: [Schumacker_8775_update....3.pdf](#), 645 kb

Understanding Potential Impacts of Seasonal Hypoxia along the Quinault Reservation Coast

Objectives:

The spatial scope, intensity and duration of hypoxia events on the 27-mile Quinault Reservation shoreline are unknown as is their impact on subtidal and intertidal ecosystems and specific organisms. Objectives of this two-year project along the coast are twofold:

- 1) Create a low-cost, model nearshore and shore-based monitoring network that engages tribal fishers and youth in gathering coastal water quality information. Data from this network will fill a critical information gap and will be quality-assured and shared on web-based public data portals.
- 2) Quantify potential impacts of seasonal hypoxia on a culturally important coastal shellfish species Pacific razor clam, (*Siliqua patula*) and use conclusions to adaptively manage that species and others. Data analyses will identify stresses to local species and contribute to ongoing west coast hypoxia and ocean acidification research.

Methodology and Results:

A nearshore water quality monitoring system was designed and tested but not deployed in 2014. Water quality monitoring instruments were purchased through this grant in summer 2014 as funds became available. Crab-pot instrument platforms were fabricated in Westport, WA over the summer. The initial crab-pot platform platforms jeopardized the instruments in the water and when they were lifted back on to vessels and were redesigned and fabricated. Funding availability and unforeseen issues did not allow deployment in the primary hypoxia season ending at the end of September. The system is now ready and will be in operation for the complete season in 2015 (May through Oct. 15).

Shore-based sampling was conducted in September and October 2014 by Taholah high-school students working with the PI and their instructor. The instrument was calibrated by the PI and the instructor and verified daily. Data were recorded by students and entered into spreadsheets in the classroom. Interpretive graphs were developed there and posted in a display in the school halls.

Two sites were within the mouth of the Quinault River, one at the bridge crossing was approximately $\frac{1}{4}$ mile upriver, another was located just inside the mouth of the river and the other sites were located on the beaches south of the river mouth.

An advisor to the project stressed the value of in-river sampling for DO intrusion into nearshore areas. The data collected by the Taholah School verify value of the two in-river sites for detecting DO events as compared to surf sites where atmospheric mixing occurs. The surf sites appear to have value for tracking temperature and salinity and may assist documenting upwelling and downwelling events (Figs. 1-3).

The Olympic Coast National Marine Sanctuary (OCNMS) is a partner and supporter of this project and places 3 seasonal moorings west-northwest of the Quinault River mouth each summer. The moorings are placed at 15, 42 and 65 meter depths and record temperature, salinity and DO. DO data from the 15 and 42 meter moorings are shown in Figures 4 and 5.

Clam population data was also collected during the summer months of 2014 but more water quality data will be needed to establish relationships.

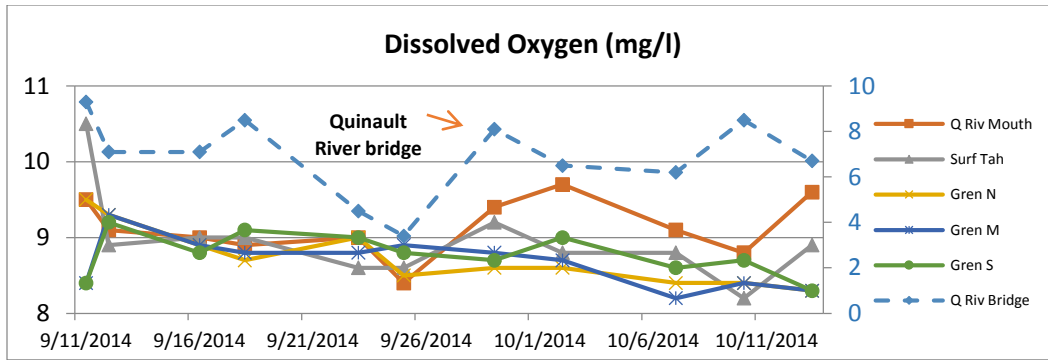


Fig.1) Dissolved oxygen data collected by Taholah School students Sep. 11 – Oct. 13, 2014. Quinault River bridge site is associated with secondary axis (right side). All other sites relate to main axis.

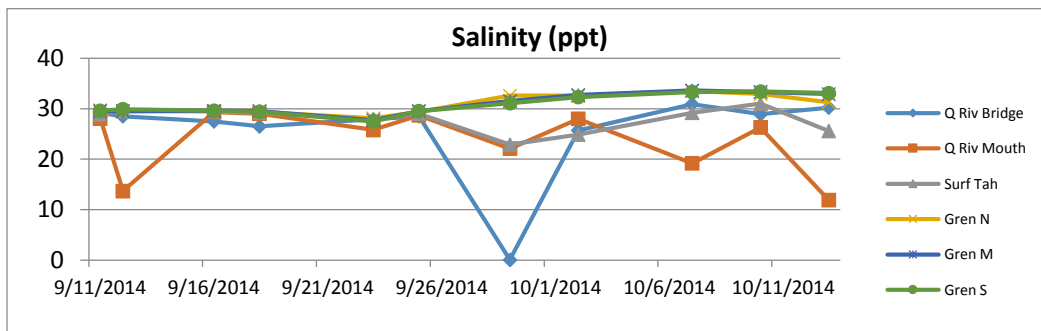


Fig. 2) Salinity data collected by Taholah School. In-river sites are subject to tidal out-flow.

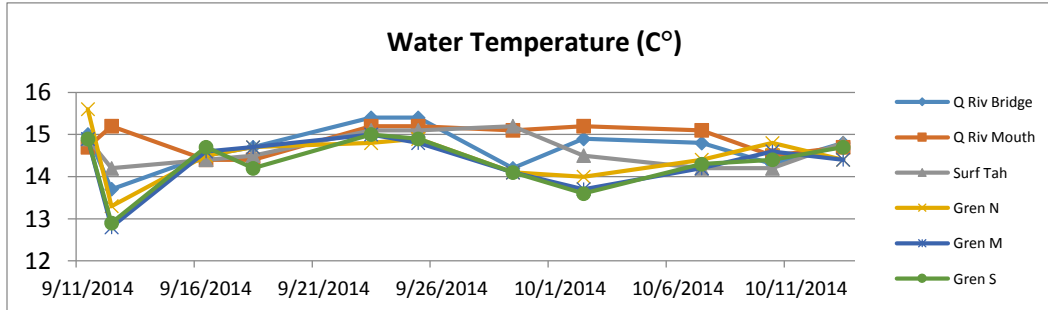


Fig. 3) Water temperature data collected by Taholah School. Sample sites on beaches south of the Quinault River are noted as Surf Tah and Gren N, M and S.

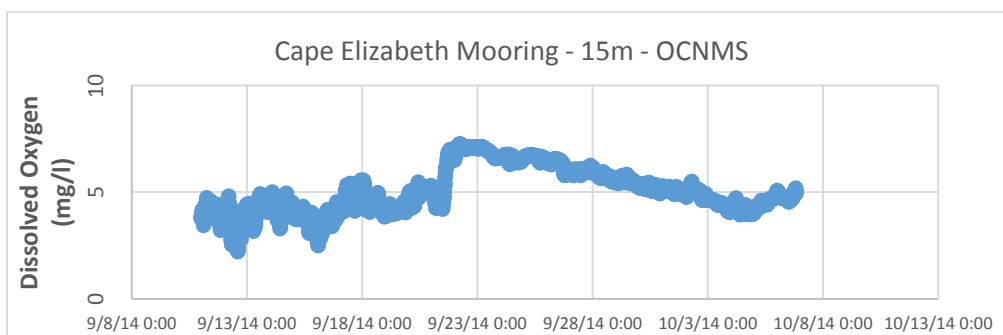


Fig. 4) DO data collected Sept. 11 – Oct. 6, 2014 by Sea Bird 37 SMP IDO mounted 1 meter above seafloor. 15m site is located approximately 3.8 km. west-northwest of Quinault River mouth.

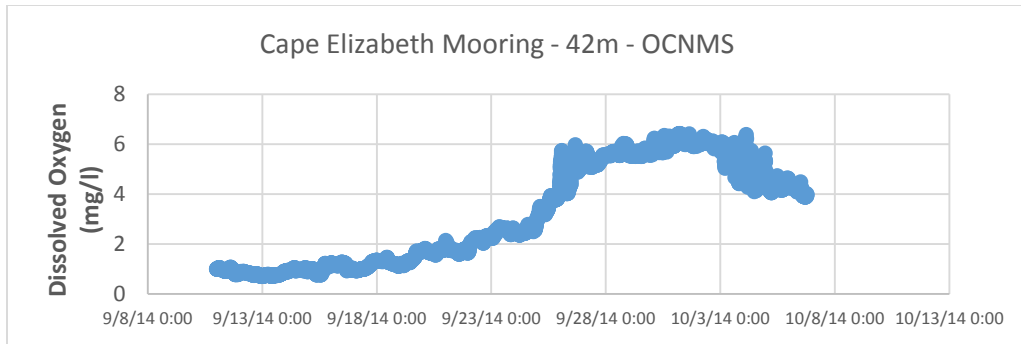


Fig. 5) DO data collected Sept. 11 – Oct. 6, 2014 by Sea Bird 37 SMP IDO mounted 1 meter above seafloor. 42m site is located approximately 12.7 km. west-northwest of Quinault River mouth.

The OCNMS mooring data suggests a persistent hypoxic event was in effect in early to mid-September 12 km. west of the Quinault River mouth and beach study sites but less so at the 15 meter site located approximately 3.8 km. from the river mouth. Both sites indicate a strong mixing event occurring near the end of September.

Figs. 1-3 also show a drop in water temperature and increase in salinity at the same time period September, beginning near Sept. 23, 2014. The data collected by the Taholah School at the shore sites south of the Quinault River reflect a similar mixing event reflected in the OCNMS mooring data.

Outreach

The PI and students and staff from the Taholah School presented the project at the OCNMS Sanctuary Advisory Council meeting in Aberdeen, WA. September 26, 2014. The project has been presented to the Grays Harbor Marine Resources Committee (MRC) and a presentation was given at the Washington Coast MRC Summit in Pacific Beach, WA October 25, 2014.

Challenges and Continuing Plans

Delayed funding to purchase instruments and materials combined with retrofitting the design of the crab-pot instrument platforms delayed deployment of the six nearshore monitoring stations until too late in the season to feasibly do so. Micro-siting the instruments requires more input from the project's science advisory team and the PI expects to meet remotely with them in May. It is anticipated that the system will be in-place for the full summer season in 2015 (June 1- Sept. 30). Crab fishers will be challenged to properly download data from the 37 SMP ODO and Onset DO units. It is planned for the PI to accompany them on at least two initial progress checks to download and maintain the instruments.

Juvenile clam population densities will continue to be monitored at the reservation beach sites but the PI and the shellfish biologist will also begin sampling from another beach site south of the reservation to determine if differences in survival exist between sites.

Water quality monitoring by the Taholah School students will continue but will need to be augmented by staff during some parts of the summer months when students will be on leave or participating in other tribal events.

Ideally the project would benefit from extending it into the summer season of 2016 to meet the objectives of the proposal. In any case it is the intention of the Quinault agency to deploy the monitoring stations each season in the future and encourage expansion of a nearshore, community based, scientific monitoring system that will aid managers and researchers.