



Photo: NOAA OCNMS

R/V *Tatoosh* is a 38ft Munson aluminum boat with jet propulsion and diesel power plant, cruising speed 20 knots; shown here departing Port Angeles Boat Haven with a crew of Oceanography 101 students from Peninsula College.



Photo: NOAA OCNMS

R/V *OC-2* is a 22ft Zodiac Hurricane RHIB shown here approaching the boat ramp at Quileute Marina in La Push, WA.

Summary of 2014 Accomplishments for Research Vessels *Tatoosh* and *OC-2*

Introduction

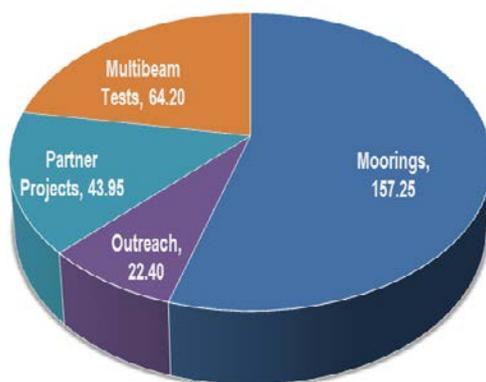
Research Vessels *Tatoosh* and *OC-2* are tasked with conducting research, observation, education, and outreach missions off the rugged Washington coast in Olympic Coast National Marine Sanctuary (OCNMS). In 2014, R/V *Tatoosh* successfully completed her 20th consecutive year of service to OCNMS. After extensive maintenance over the last several years, *Tatoosh* now sports re-built engines which have noticeably improved performance and reliability. Recent upgrades have also resulted in top of the line safety equipment, essential for remote operations in harsh environments. R/V *OC-2* is in very good condition for its age and is utilized for near shore monitoring, staff training, and day projects trailering and local deployment are convenient.

Oceanographic Moorings

In 2014 OCNMS completed the 14th year of its near shore monitoring program deploying, maintaining, and recovering

moorings at 10 sites along the coast between May and October. The monitoring program measures dissolved oxygen, temperature, conductivity, turbidity, and currents. These parameters can be used to assess and model climate change, larval dispersal, hypoxia, productivity, and harmful algal blooms throughout the sanctuary. Moorings were positioned on five transects along the 135 mile sanctuary coastline in water depths ranging from 15 to 42 meters. Also, OCNMS worked in collaboration with the Applied Physics Laboratory (APL) at the University of Washington to deploy SBE-56 Temperature Loggers on select mooring locations in support of coastal monitoring efforts and internal wave research. These loggers were deployed on 5 summer moorings, and are currently deployed for the winter on a 42 meter mooring off Teahwhit Head along with TidbiT temperature loggers. With the removal of the APL ChaBa data buoy for the winter, OCNMS winter moorings will provide a unique winter dataset for temperature throughout the water column during the winter months. OCNMS also collaborated with the Quileute Tribe's Department of Natural Resources to complete the 2014

2014 Allocation of Project Hours



Summary

- Support area: 3,310 square miles
- Days at sea: 50
- Project hours: 288
- Approximate cost per day: \$1,350
- Fuel: 3719 gallons diesel
- Total Distance Run: over 2,000 Nautical Miles
- Education and Outreach: multiple groups, tribes, and stakeholders reached
- Research: long-term monitoring projects maintained and innovative partnerships with other research organizations formed

Vessel Acquisition

OCNMS research vessels, particularly R/V *Tatoosh*, have served the sanctuary for much longer than their forecasted service life. In the *ONMS Small Boat Requirements Study* published in 2006, R/V *Tatoosh* was scheduled for replacement in 2008 and R/V *OC-2* in 2012.

Rigorous preventative maintenance and substantial capital investments have kept the vessels operational with some interruptions to field work. *Tatoosh* is nearing the end of its useful life, unavoidable wear on the hull and power plant reduce the vessels reliability and have resulted in costly repairs and loss of operating sea days.

Replacement efforts for R/V *Tatoosh* will need to be a high priority to avoid interruption in OCNMS field operations for ongoing research and developing partnerships. A larger, more stable vessel would not only expand the potential for OCNMS operations but also make it a more viable asset for our partners.

mooring program; the tribe contributed a biological field technician, Rio Foster, to assist as vessel crew and member of the science team.

Habitat Mapping

OCNMS began seafloor mapping from the R/V *Tatoosh* in 2010, but needed to lease some components of its multibeam sonar system. In 2014, OCNMS received navigational components from NOAA's Navigational Response Branch that were installed permanently on the sanctuary's vessel. The R/V *Tatoosh* equipment was then professionally surveyed for accurate placement and calibrated by NOAA Pacific Hydrographic Branch technicians. This upgrade improves the quality of sonar data produced from R/V *Tatoosh* during bathymetric and habitat mapping surveys. During the 2014 field season the OCNMS

field crew mapped two sunken vessels in order to evaluate potential salvage options and the extent of natural resource damage. Continued mapping of the Quileute Needles was postponed due to equipment malfunctions that prevented further mapping this field season.

Education and Outreach

OCNMS' R/V *Tatoosh* had the pleasure of hosting several distinguished guests this year. Guests included: Olympic National Park Coastal Interpreter staff, The Nature Conservancy, volunteers from the COASST program and Olympic Discovery Center, and students of the Peninsula College's Oceanography 101 class led by Dr. Ian Miller, Washington Sea Grant.

Ocean Observatories Initiative

Sponsored by the National Science Foundation, the Ocean Observatories Initiative (OOI) is constructing a network of science-driven sensor systems to measure the physical, chemical, geological, and biological variables in the ocean and seafloor. Greater knowledge of these variables is vital for improved detection and forecasting of environmental changes and their effects on biodiversity, coastal ecosystems, and climate. OCNMS is actively providing logistical support for this project and has supported site visits and inspections for OOI installations in the sanctuary over the past year. More information is available at: <http://ceoas.oregonstate.edu/ooi/>



Photo: NOAA OCNMS

OCNMS mooring radar reflector and surface float.



Photo: NOAA OCNMS

R/V *Tatoosh* hauled out on the travel lift for a survey of critical points for hydrographic survey.



Photo: NOAA OCNMS

R/V *Tatoosh* hosts Peninsula College's Oceanography 101 students, braving the cold for education and science!

Kelp Watch 2014

Research Vessel *OC-2* played a critical role in supporting Kelp Watch 2014 and Washington Department of Health. Near shore kelp and water samples were gathered to establish baseline radiation levels in sub-tidal kelp species, making it possible to monitor for changes caused by recent or future radiological events. More information is available at:

<http://kelpwatch.berkeley.edu/>

Unmanned Aerial Vehicles

Unmanned Aircraft Systems (UAS) are revolutionizing NOAA's ability to monitor and understand the global environment. There is a gap in technical capabilities today between instruments on the Earth's surface and from satellites - UAS bridge that gap. Operated by remote pilots, UAS can collect data from dangerous or remote areas such as pinnacles on Washington's outer coast. In collaboration with NOAA's Office of Marine and Aviation Operations (OMAO) and the United States Fish and Wildlife Service (USFWS), OCNMS hosted the UAS system named PUMA on the outer coast this year. The PUMA system utilized *R/V Tatoosh* as an operations platform to survey seabird nesting grounds and evaluate wildlife response to the aircraft. More information is available at:

<http://uas.noaa.gov/>

Water Current Profiling

In collaboration with NOAA's Center for Operational Oceanographic Products and Services (CO-OPS) OCNMS began

gathering Acoustic Doppler Current Profiler (ADCP) data off the coast of Washington. OCNMS also assisted with a test deployment of new mounting technology for ADCPs commonly used throughout the country. OCNMS looks forward to partnering with CO-OPS as they begin a 3-year survey of currents in Puget Sound and the Strait of Juan De Fuca. More information is available at:

<http://tidesandcurrents.noaa.gov/>

Plankton Monitoring

The Olympic Region Harmful Algal Blooms (ORHAB) Partnership was formed in June 1999 by local residents and coastal communities in response to unpredictable closures of the shellfisheries. Closures were due to outbreaks of marine biotoxins and domoic acid contamination of razor clams and other bivalves, which can cause paralytic shellfish poisoning (PSP). It became clear that in order to manage these outbreaks there was a need to better understand underlying dynamics of these disruptive harmful algal bloom (HAB) events. Research efforts, made possible by federal funding from NOAA, have been underway since the summer of 2000. In collaboration with ORHAB and the Quileute Tribe's Department of Natural Resources, OCNMS has collected water samples in parallel with servicing OCNMS' oceanographic moorings. Quileute technicians analyze the water samples for presence and density of HAB organisms. More information is available at:

<http://www.orhab.org/>

Navigation Response Branch

In collaboration with NOAA's Office of Coast Survey, the *R/V Tatoosh* has been outfitted to serve as a Vessel of Opportunity (VOO) for regional emergencies. This fills a need due to the regional asset for NOAA's Navigation Response Branch, NRT 3, has been out of commission for an extended period of time. The *R/V Tatoosh* is well suited to fill this need until a new asset can be brought online in Puget Sound.

Enforcement

OCNMS *R/V Tatoosh* utilized her newly installed multibeam system to locate two recent shipwrecks in the sanctuary, the *M/V La Pietra* and *F/V Fjord Mist*. Locating these wrecks is critical for enforcement proceedings to evaluate salvage options potential impacts on the surrounding ecosystem. The *M/V Koprino* was also searched for but has not yet been found.

Maritime Heritage

There are over 150 documented historical shipwrecks within OCNMS, most of which have not been surveyed and cataloged. Pending repairs to the multibeam system on *R/V Tatoosh*, OCNMS intends to continue work supporting this critical documentation of our maritime heritage in the 2015 field season.



Photo: NOAA OCNMS

Macrocystis Kelp sampled for Kelp Watch 2014 radiological baseline data.



Photo: NOAA OCNMS

OMAO PUMA team in action, launching the PUMA from *R/V Tatoosh* on the WA coast.



Photo: NOAA OCNMS

Pulling up a plankton sample for ORHAB collaboration.

Success

Despite fiscal challenges and a government shutdown, R/V *Tatoosh* and R/V *OC-2* were successfully operated and managed by Olympic Coast National Marine Sanctuary for 50 sea days and 288 project hours in FY2014. Both platforms were vital to maintaining important long-term monitoring projects with partners, in addition to meeting the needs of new partners. Education and outreach opportunities supported by OCNMS vessels are unique ways to make the sanctuary accessible and provide an outdoor classroom for direct, experiential learning.

This year's field season was made possible through efforts from our long time vessel captain and member of our research team, Rick Fletcher, CDR/NOAA Corps (retired) who will be retiring from the sanctuary after over 9 years of vessel operations. We are excited to have a new member for the research team, Kathy Hough, who has extensive experience as a NOAA survey technician, most recently on the NOAA Ship *Reuben Lasker*.

The demand for vessel use is projected to remain high in 2015 with new partnerships forming and inter-agency collaboration becoming the norm. R/V *Tatoosh* and *OC-2* continue to be important assets in OCNMS, and the sanctuary intends to continue pursuing acquisition of a larger and more capable vessel to meet the multitude of research needs off the Washington coast.

Thank you to the Quileute Tribe's Department of Natural Resources for providing field biologist Rio Foster's time in support of the OCNMS 2014 mooring program. Thank you to the following OCNMS volunteers who have contributed their valuable time as crew members aboard R/V *Tatoosh* and R/V *OC-2*. We couldn't do it without you!



Rick Fletcher CDR/NOAA Corps (retired)
Mooring Recovery 2014 – NOAA OCNMS

OCNMS Volunteers

Brian Marts
Sean Farrar
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Lee Shoemaker
Josh Haltom
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or visit our website at: olympiccoast.noaa.gov