

## Observing Hypoxia Along the Oregon and Washington Coasts

In summer 2006 marine life was devastated by hypoxia, or low-oxygen, along the Oregon and Washington coasts. The Quinault Indian Nation (QIN), a NANOOS member, saw bottom fish strewn across beaches and crab pots filled with dead crabs. The fishing economy that the Quinault people depend on, as well as a good amount of their food, was threatened by this extreme event. What happened?

A full answer requires an understanding of the science of hypoxia and having “eyes” on the marine environment to detect events in a given year. NANOOS is providing observations of hypoxia along the OR–WA coast through a collection of shelf buoys and gliders operated by NANOOS partners Oregon State University (OSU), the Center for Coastal Margin Observation and Prediction (CMOP), and, starting this summer, the University of Washington (UW). Data from these assets and many others are available through the NANOOS Visualization System (NVS).

Scientists know the deep ocean waters offshore the Pacific Northwest coast are naturally low in oxygen and high in nutrients. Summertime coastal winds typically blow from the north, driving surface ocean waters offshore and deep, oxygen-poor, nutrient-rich waters toward the surface in a process called upwelling. Upwelling brings nutrients to the surface to support growth of single-celled algae (phytoplankton) that are the base of the marine food web, which includes the fish and shellfish the QIN rely on. Winds blowing from the south reverse the process — downwelling moves surface waters landward and puts a layer of warm,



CMOP field team, Michael Wilkin and Katie Rathmell, with AUV Phoebe

nutrient-poor water over the coastal ecosystem. See the NANOOS hypoxia page at [www.nanoos.org](http://www.nanoos.org).

In 2006 upwelling persisted for four months. OSU scientists saw that oxygen levels went low enough to suffocate marine organisms or force them to move up into the water column or very close inshore. Though not every year is as bad as 2006, the recent data suggest a fundamental shift in ocean conditions off the PNW coast. The complex changes are likely due to changes in both the ocean and atmosphere. What can help people dependent on coastal resources, like the QIN, be better advised of and prepared for these changes?

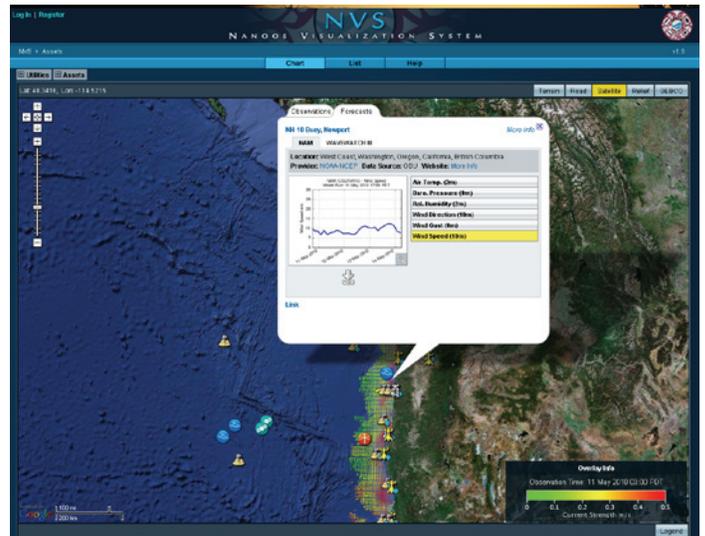
A collaboration between the QIN and CMOP to observe hypoxia developed during last year’s NANOOS Governing Council meeting. CMOP’s ocean observing program now collects vital data within QIN fishery areas. Joe Schumacker, QIN marine scientist and NANOOS Governing Council member, is partnering with CMOP scientists to use CMOP’s autonomous underwater glider “Phoebe” to identify low-oxygen zones. The QIN volunteered use of several fishing vessels and labor. CMOP’s coverage for coastal hypoxia observations was expanded and the QIN received the first-ever detailed data on oxygen in the waters of their Tribal fishing grounds — a win/win situation for science and the QIN. Phoebe’s data give a detailed look at where the low-oxygen water is coming from, and may enable prediction of hypoxic events. Said Schumacker, “If there are changes coming, it is good to know about them before they hit.”

## Products/Tools

### Visit the Latest Release of the NANOOS Visualization System

In May 2010 NANOOS released version 1.6 of the NANOOS Visualization System (NVS). NVS is your online tool for easy access to ocean observing data in the Pacific Northwest, available at [www.nanoos.org/nvs](http://www.nanoos.org/nvs). NVS gathers data across a wide range of sources including buoys, shore and land-based stations throughout the NANOOS region (Canada to California). NVS was first launched in the fall of 2009, and is continually being improved and refined as new data streams are brought in and as the NANOOS NVS development team receives feedback from users. **New in NVS 1.6 is access to surface currents, temperature and ocean color from satellites, and improved filters, legends, and data plots.** Users can also find data from research cruises and forecast information on water levels and waves for many locations. Please provide input on NVS at the website so we can make this utility even more useful.

*NVS Development Team: Troy Tanner, David Jones, Nicholas Lederer, Emilio Mayorga, (APL-UW); Jonathan Allen (DOGAMI); Craig Risien (OSU); Rick Blair, Stephen Uczekaj (The Boeing Company); Alex Jaramillo, Charles Seaton (CMOP)*



### Are You in a Tsunami Evacuation Zone?

If you're traveling along the Oregon coast and need to know if you're in danger of being hit by a tsunami, the NANOOS web tool Tsunami Evacuation Map can tell you. Tsunamis, the dangerous large waves generated by earthquakes, can imperil people on beaches, in low-lying areas, by bay mouths or tidal flats, and near river mouths. The Tsunami Evacuation Map gives users menus to locate evacuation maps for specified towns or street addresses for any location along the Oregon coast. The map viewer displays the evacuation maps



(where available) as a red zone, overlaid on top of a simple Google Map interface, enabling users to quickly identify whether they are within or outside of a tsunami inundation zone. This web product uses the latest scientific techniques and technology to provide the best information on tsunami evacuation zones available.

*Development Team: Jonathan Allan and staff (DOGAMI), Craig Risien (OSU), Troy Tanner (APL-UW), Oregon Emergency Management, and NOAA*

[www.nanoos.org/data/products/oregon\\_tsunami\\_evacuation\\_zones/index.php](http://www.nanoos.org/data/products/oregon_tsunami_evacuation_zones/index.php)



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## New Capabilities: Field & Lab

### Field Demonstration for Carbon Dioxide Sensors

The Alliance for Coastal Technologies (ACT), part of the Integrated Ocean Observing System (IOOS), is a NOAA-funded partnership of research institutions, coastal resource managers, and private sector companies dedicated to fostering the development and adoption of effective and reliable coastal monitoring sensors and platforms.

ACT is committed to providing the information required to select the most appropriate tools for the study and sustained observation of coastal environments. Priorities include transitioning emerging technologies to operational use rapidly and effectively; maintaining a dialogue among technology users, developers, and providers; identifying technology needs and novel technologies; documenting technology performance and potential; and providing IOOS with information required for the deployment of reliable and cost-effective sensor networks.

Last year ACT fielded two pCO<sub>2</sub> (carbon dioxide) sensor demonstrations, one in Kaneohe Bay, Hawaii, and one in Hood Canal, Washington. These sensors are essential for measuring ocean acidification. From August through September, ACT utilized a profiling ORCA buoy at Twanoh, operated by the University of Washington and partially funded by NANOOS, to put ten commercial CO<sub>2</sub> sensors simultaneously into the same easily-accessible environment in the Canal, for inter-comparison. Independent chemical analyses (done in labs ashore) provided accurate CO<sub>2</sub> concentrations against which to compare the instruments over the duration of the deployment. When available, the results will give investigators an idea which instrument would be the best for their purposes, and also will tell instrument manufacturers how they might need to improve their products.

The Twanoh buoy is part of the NANOOS observing

system, and its data can be seen via NVS. In collaboration with NOAA PMEL, this buoy has had a NOAA pCO<sub>2</sub> sensor on it since July, 2009. The Hood Canal Salmon Enhancement Group, a NANOOS member, along with NANOOS Executive Director and ACT Stakeholder Council Co-Chair Jan Newton, and two student interns from the UW School of Oceanography, funded through UW's CMOP Education program, provided ACT with much of the logistic and analytical support.

NANOOS is pleased to be part of ACT's demonstration project and to facilitate the increased use of pCO<sub>2</sub> sensors for coastal monitoring.



*The APL-UW research vessel M/V Mackinaw with ACT and NOAA Pacific Marine Environmental Laboratory staff aboard*



*UW-CMOP Intern Sarah Huffer preparing equipment on the dock*

## Member Spotlight

### VENUS Joins NANOOS



The Victoria Experimental Network Under the Sea (VENUS) is a seafloor observatory in Canada's coastal ocean connected to researchers and observers on shore by fiber optic cable. The VENUS facility is run by the University of Victoria in British Columbia, Canada. Two seafloor networks of instruments and sensors, one in Saanich Inlet and another in the Strait of Georgia, are now connected to the NANOOS NVS. Measurements, images, and sound are also available via the VENUS website.

Dr. Verena Tunnicliffe, VENUS Director and NANOOS Governing Council member, relates, "VENUS took a major step in its development when it joined NANOOS. The ocean does not see borders, nor should our observations. By linking facilities under the umbrella of NANOOS, we can expose our research communities to a greater combined database and more opportunities for collaboration. Equally important is the ability to share observations with educators and the public in both the U.S. and Canada at a time when ocean change on the west coast of the continent is increasing in intensity ... and concern."

### Thank You New Members

NANOOS membership has increased to 44 entities with the addition of the University of Oregon and The Nature Conservancy.



#### NO Staff:

Jan Newton | NANOOS Executive Director  
Amy Sprenger & Eric Shulenberg | Editors  
Kim Reading | Designer

## Happenings

### Coastal Buoys Re-deployed for Summer

In mid-April NANOOS members OSU and CMOP, led by NANOOS PI Murray Levine, went out on a four-day buoy deployment and research cruise along the Oregon and Washington coasts. The crew deployed three buoys, including the summer installation of the NH-10 buoy off of Newport that is managed by OSU and partially supported through NANOOS. The summer installation of the buoy equipped it with more sensors to monitor ocean acidification and hypoxic conditions. The data coming from these sensors is available in near real time from the NANOOS NVS. CMOP staff member Jeff Schilling posted pictures and video blogs on the buoy deployments and research online at:

[www.stccmop.org/news/multimedia](http://www.stccmop.org/news/multimedia)



### Educators! Join NANOOS at the 2010 NAME Conference

Amy Sprenger, NANOOS Education and Outreach Coordinator, will be co-presenting a full-day workshop, "Using the Ocean to Teach STEM Curriculum," at the Northwest Aquatic and Marine Educators (NAME) Conference on July 7, 2010. NAME, a NANOOS member, sponsors an annual summer conference for educators and scientists alike interested in aquatic and marine education. This year's NAME conference theme is "No Child Left Inside" and will be held July 7-12 in Florence, OR. The workshop, which includes co-presenters from Oregon Sea Grant, Oregon Coast Aquarium, and NANOOS, will include an overview of ocean literacy, an introduction to the new Oregon state science standards, and classroom activities using NANOOS data. For more information on the NAME conference, visit [www.pacname.org](http://www.pacname.org).