

Olympic Coast National Marine Sanctuary

Nearshore Characterization of Resources and Processes

Management Issue

Nearshore oceanographic conditions within the Olympic Coast National Marine Sanctuary (OCNMS or Sanctuary) are poorly characterized with respect to temporal and spatial dynamics and the associated ecological processes. This includes concerns about harmful algal blooms (HABs) and recent hypoxic events.

Description

Coastal ocean conditions off the Olympic Coast of Washington have a high degree of temporal and spatial variability which limit our predictive abilities and complete understanding of regional oceanographic processes. This variability can span time scales of diel (day vs. night) through decadal (e.g., Pacific Decadal or El Niño Southern Oscillations) and spatial scales of micro- (1 to 10 km) and meso- (10's to 100's of km). Such variability can have profound implications for the sanctuaries living resources. For example, strong El Niño years are positively correlated with seas surface temperature and negatively associated with primary productivity within the Sanctuary.



*Deployment of mooring instruments from the R/V Tatoosh.
Photo Credit: OCNMS*

To fill some of these data gaps, OCNMS has maintained a seasonal nearshore (inner-shelf ~5-10 km from shore) oceanographic mooring program since 2000 to measure water temperature. Additional sensors were later added to measure salinity, dissolved oxygen (DO), water currents and indicators of primary productivity (chlorophyll a), albeit not all mooring stations have a complete array of instruments. In 2007 and 2008, mooring were deployed from May to October in Sanctuary waters at 13 stations from Makah Bay to Cape Elizabeth. Mooring data has also been supplemented with boat-based oceanographic measurements.

Nearshore mooring data are useful to federal, tribal, university and state-sponsored studies predicting harmful algal blooms thereby helping assess potential threats to human health, shellfisheries, seabirds and marine mammals. These data are also used in the study of intertidal invertebrate and algae dynamics, the ground-truthing of remote sensing data, assisting with oil spill response and improving our understanding of hypoxic conditions measured in nearshore waters of Washington and Oregon in recent years. Nearshore data from the sanctuary will also play a role in larger scale studies of the global climate change or California Current Large Marine Ecosystem.

Questions and Information Needs

- 1) What are the temporal and spatial scales of physical oceanographic processes in the Sanctuary? What is variability of these data on annual and decadal time scales?
- 2) How do these mooring data compare with and complement remote sensing data?
- 3) Is our nearshore monitoring sufficient to detect climate change as a sentinel site?
- 4) What data are best used for characterization of upwelling/downwelling and what degree of change (e.g., 2 or 4 or 10° C) is indicative of this shift?
- 5) Can the mooring data be used as a predictive tool for hypoxia and harmful algal blooms? Are there other physical parameters that correlate with these events?
- 6) How do OCNMS DO levels (and any other parameters that trend with DO) compare to regional hypoxia hotspots such as Hoods Canal, Oregon coast, offshore Washington and coastal Vancouver Island?
- 7) How do current patterns or parameters indicating plankton density (light/turbidity) correspond to paralytic shellfish poisoning (PSP) levels in shellfish?
- 8) What parameters can be linked to biological phenomenon (e.g., plankton density and light) as indicators?

Current as of 9/16/2014

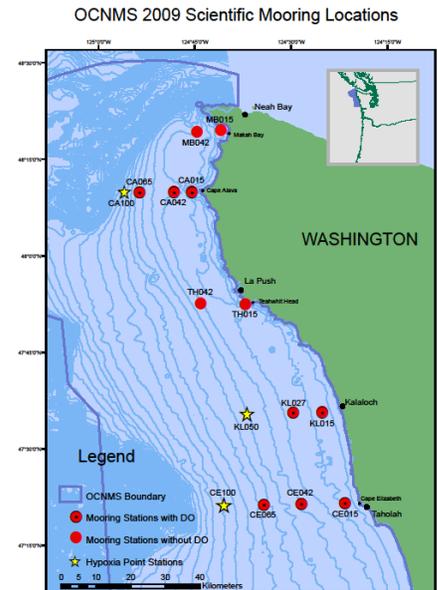
For More Information -- <http://www.sanctuaries.noaa.gov/science/assessment>

Scientific Approach and Actions

- Continuous data logging instruments including surface current meters, fluorometers, dissolved oxygen, conductivity-temperature sensors and thermistors from mid-spring to mid-autumn.
- Perform CTD (conductivity, temperature and density) casts at each station to quality control (QC) corresponding mooring instruments
- Process data and format to the NCDDC West Coast Observation System (WCOS) where a format exists and following OCNMS or Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) protocols where WCOS do not exist or for site use
- In 2004, OCNMS initiated DO monitoring to determine the timing, severity and extent of hypoxic events (defined as DO concentrations below 2 parts per million)

Key Partners and Information Sources

Olympic Region Harmful Algal Bloom consortium (ORHAB), Ecology and Oceanography of Harmful Algal Blooms (ECOHAB) of the Pacific NW, University of Washington, Oregon State University, NOAA Fisheries, coastal tribes, PISCO, WCOS and the Northwest Association of Networked Ocean Observing Systems (NANOOS), which is the regional Integrated Ocean Observing System (IOOS) for the Pacific Northwest.



Nearshore oceanographic moorings in the sanctuary. Map credit OCNMS

Management Support Products

- As metadata standards are developed by a team of PISCO, NOAA and other oceanographers, additional data with metadata will be housed by NCDDC WCOS, and in the mean time, is available by request from OCNMS after it has been quality control checked
- Mooring data will need to be added to a public data portal at <http://portal.ncddc.noaa.gov/wco/>
- Posters, papers, maps, presentations and outreach products for scientific and lay audiences

Planned Use of Products and Actions

- These data can be shared with other researchers, such as fisheries biologists, to better understand the effects of ocean conditions on these economically important resources.
- The data can assist the NOAA Office of Response and Restoration for trajectory modeling, and if the moorings eventually supply real time data then for spill response
- The Sanctuary can use mooring data to indirectly assesses responses to climate change in biota through long-term monitoring of marine birds and mammals, intertidal organisms, harmful algal blooms, and invasive species, as well as hypoxic conditions
- Determine associations between ocean conditions, possibly driven by climate change, and the presence of harmful algal blooms or hypoxic conditions are explored

Program References

OCNMS Management Plan

- 1994 Management Plan: Research (III) 1&2, baseline research & monitoring
- 2008 Management Plan Review: Priority Topics C & E
- (http://olympiccoast.noaa.gov/protection/mpr/mpr_prioritytopics.html)

OCNMS Condition Report, 2008

- Questions 1-3

ONMS Performance Measures

- By 2015, 100% of the sanctuary system is adequately characterized.

Other Documents

- OCNMS Science Framework, 2003
- <http://olympiccoast.noaa.gov/research/interested/welcome.html>

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