Pacific Northwest Harmful Algal Blooms Bulletin

Sep 26, 2017 HAB risk =

HAB risk key:

- = *low*
- = *medium*
- = *high*

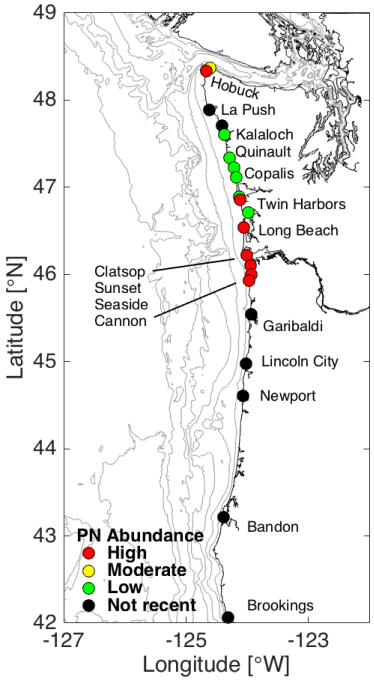
JISAO Joint Institute for the Study of the Atmosphere and Ocean

School of Oceanography, University of Washington

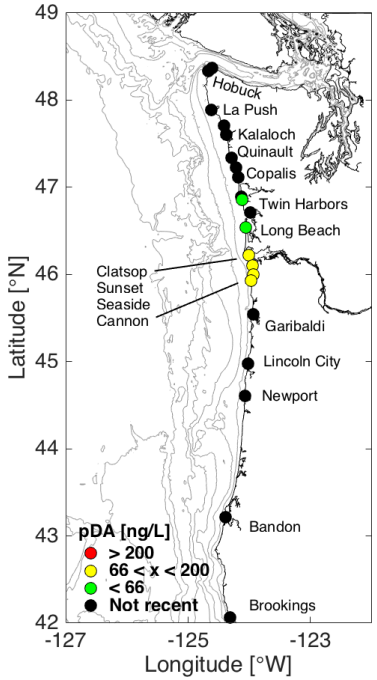
ORHAB Partnership

Beach Sampling

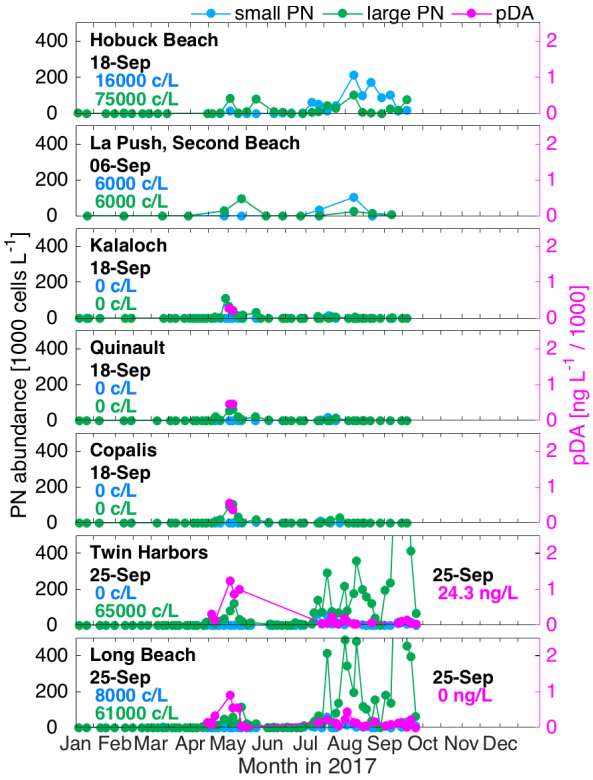
(*Pseudo-nitzschia*)



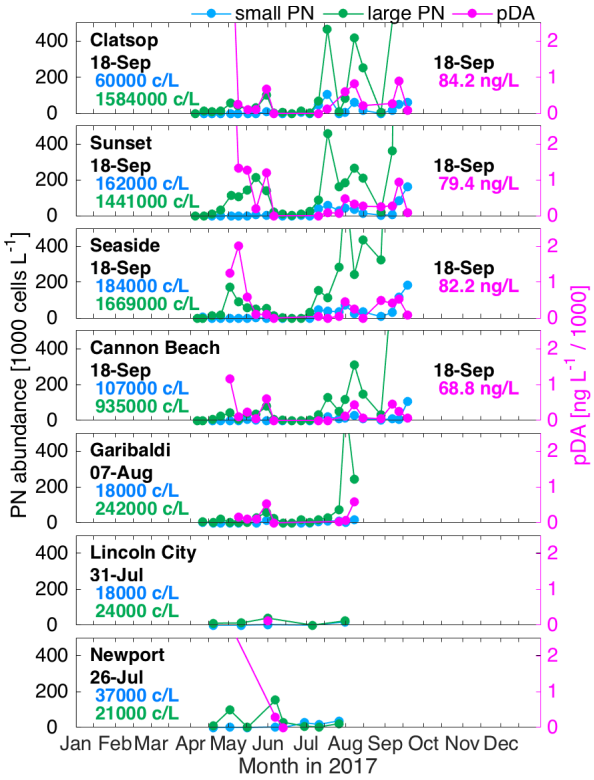
(particulate domoic acid)



WA *Pseudo-nitzschia* & domoic acid

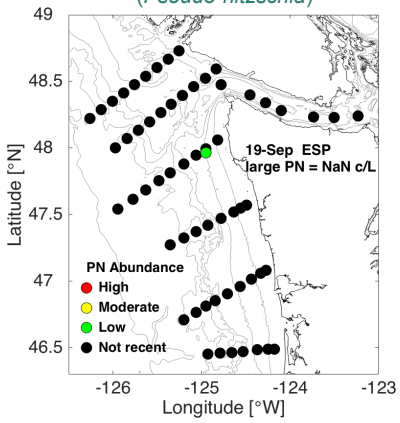


OR *Pseudo-nitzschia* & domoic acid

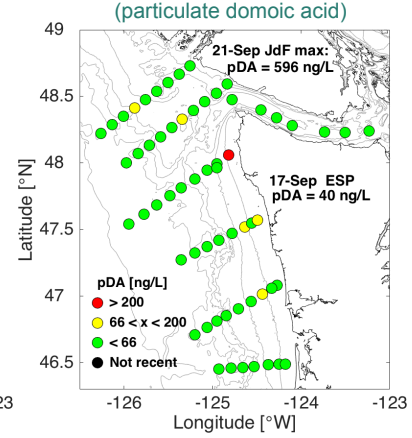


Offshore Sampling

(*Pseudo-nitzschia*)



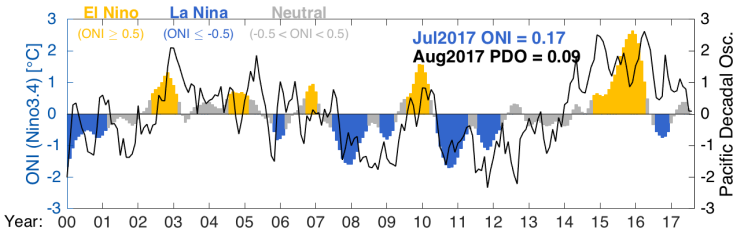
(particulate domoic acid)



Pseudo-nitzschia (*PN*) abundances are quantified for large and small cell morphologies using light microscopy. Threshold values of 50,000 cells/L for large cells, and 1,000,000 cells/L for small cells trigger additional testing for water column particulate domoic acid (pDA). Water column pDA values >200 ng/L often lead to toxin accumulation in shellfish such as razor clams. Sampling sites, colored by relative *PN* abundance (*high:* > threshold value for either cell morphology; *moderate:* > 1/3 threshold value; *low:* < 1/3 theshold value) and pDA, are shown in the upper left two panels. "*Not recent*" indicates that there were no data within the previous 15 days. Time series of *PN* abundance (cells per liter = c/L) and pDA at select beaches are shown in the upper right main two panels. Offshore samples (lower left) are collected and analyzed at ~2 week intervals during late summer/early fall. Additional samples are collected by a remotely operated Environmental Sample Processor (ESP) that is moored off La Push, WA, in late spring and late summer.

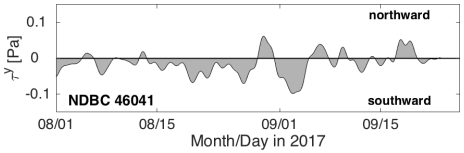
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health and the Oregon Department of Agriculture after measuring toxin levels in shellfish collected from each beach (WA link; OR link), and not from the information presented here. However, the information presented here aids coastal managers in better understanding and predicting the onset, duration, and magnitude of toxin outbreaks as well as their impacts.

Pacific Ocean Indices



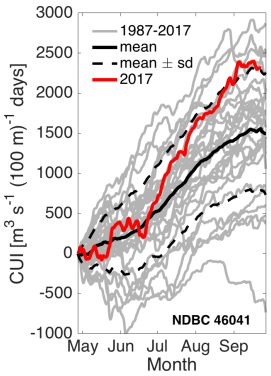
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

North-south wind stress

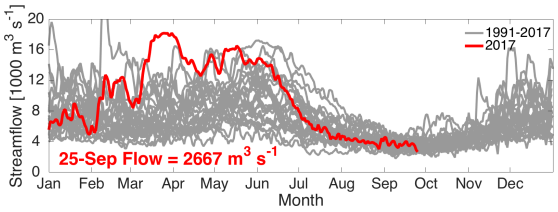


Southward wind stress drives coastal upwelling that can lead to plankton blooms. Northward wind stress tends to push any existing offshore plankton and toxins towards beaches. In addition, summer/fall toxic blooms often occur in years with a moderate cummulative upwelling index (i.e. during years with fluctuating winds) rather than in years with sustained upwelling or downwelling winds.

Cumulative Upwelling Index

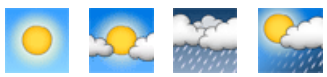


Columbia River Discharge



The Columbia River plume can help transport HABs and toxins from the south, northward along the WA coast. However, the plume can also serve as a protective barrier by preventing offshore toxins from reaching beaches.

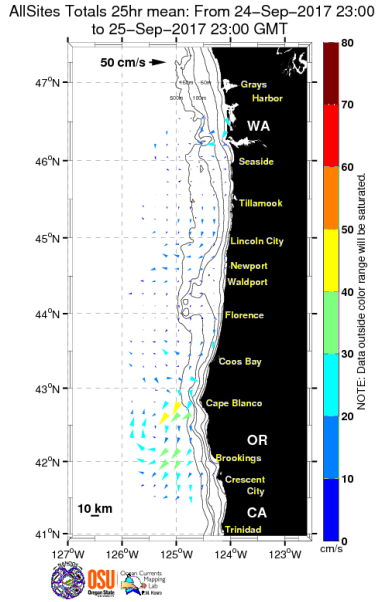
Marine Weather Forecast



Wed - N wind, 10 kt
Thur - E wind, 10 kt
Fri - SW wind, 15 kt
Sat - N wind, 20 kt

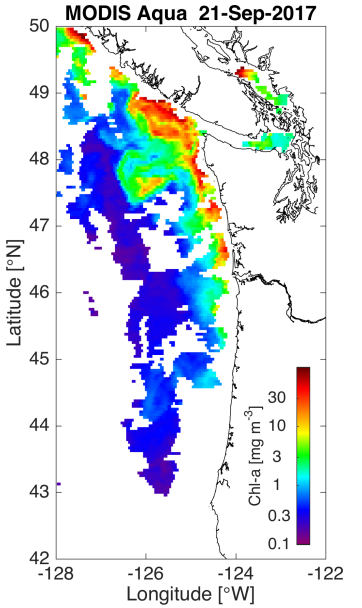
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

Ocean Surface Currents



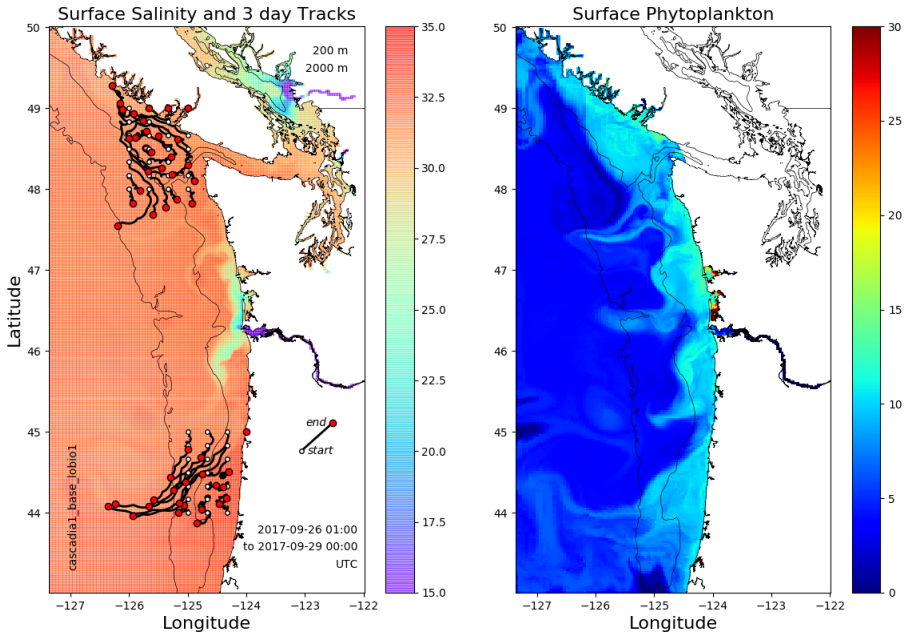
Primary currents flow north and south in winter and summer, respectively, except within ~10 km of shore, where fluctuations follow changes in wind direction.

Satellite Chlorophyll-*a*



Clouds often obstruct satellite views, but the extent of phytoplankton blooms can at times be seen from space. Blooms do not necessarily reflect the presence of toxins.

LiveOcean Forecast Model



Model predicted sea surface salinity and phytoplankton with particles released near the Juan de Fuca eddy and Heceta Bank and tracked 3 days into the future.

Summary - Dense phytoplankton blooms have continued on the coast since early July in response to strong upwelling. At present, large-cell morphologies of *Pseudo-nitzschia* (*PN*) remain dominant on WA and northern OR beaches at concentrations well above the action levels, with highest abundances off northern OR (1,669,000 cells/L at Seaside). Few cells are present at central WA beaches. Small cell morphologies of *PN* have recently increased in northern OR (~184,000 cells/L at Seaside on 18-Sep). Water column particulate domoic acid (pDA) has been elevated in prior weeks at southern WA and northern OR beaches but more recent samples show pDA has generally dropped to <100 ng/L (one exception was Long Beach at 211 ng/L on 21-Sep). Over the past week samples collected on the R/V *Shimada* cruise off WA and OR showed relatively dense concentrations of large-type *PN* cells at many sites with small-type cells present. Cell abundances are not yet quantified. Ship sampled pDA as of 23-Sep was generally low off WA except at some sites near the Juan de Fuca eddy (192 ng/L) and at nearshore sites off La Push (596 ng/L), Quinault (109 ng/L), and Grays Harbor (102 ng/L). Ship sampled pDA values were <12 ng/L at sites off northern OR on 25-Sep. WDOH reports that recent razor clam DA levels in WA were all below the 20 ppm limit with highest values at Quinault (13 ppm on 11-Sep). ODFW reports that many sites in OR still have razor clams over the 20 ppm limit, although recent samples at Clatsop were at 19 ppm.

Forecast - ENSO conditions have been neutral and most predictions suggest this to continue through winter, although some recent models indicate the development of La Niña as early as autumn. The PDO remains weakly positive. The short-term weather forecast predicts variable winds over the next few days; upwelling-favorable conditions are likely through Wednesday, with a switch to downwelling conditions by Friday. Unsettled weather could persist into next week. The LiveOcean forecast also suggests continued upwelling, but with notable retention at known HAB hotspot sites. Because DA continues to be present in the water column at relatively low but significant levels nearshore and because of the weak and fluctuating nature of predicted coastal winds, we suggest that there is a relatively low risk for toxic events over the next few days that increases to moderate risk beyond the week's end. Continued caution is advised.