# Pacific Northwest Harmful Algal Blooms Bulletin

**Sep 3, 2018 HAB risk =** ✔

*HAB risk key:*

- ✔ = *low*
- ⚠ = *medium*
- ✖ = *high*

JISAO Joint Institute for the Study of the Atmosphere and Ocean

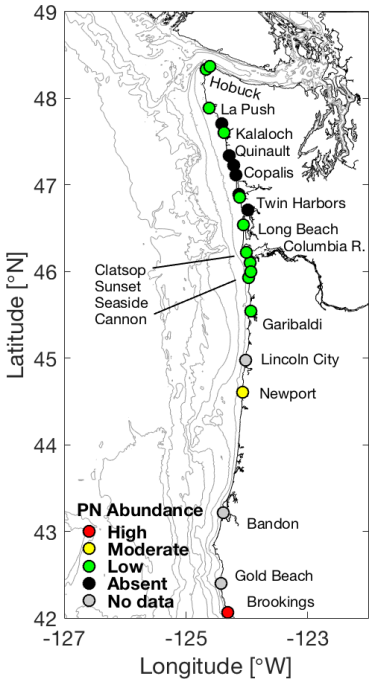
School of Oceanography, University of Washington

ORHAB Partnership

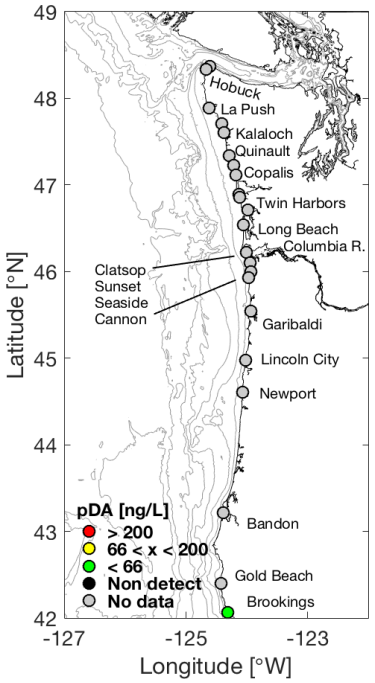
The statements, findings, conclusions, and recommendations do not necessarily reflect the views of NOAA or the Department of Commerce.

## Beach Sampling

(*Pseudo-nitzschia*)

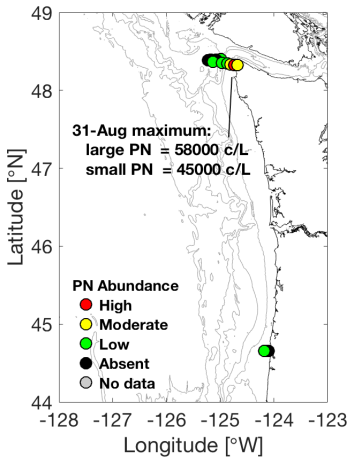



(particulate domoic acid)

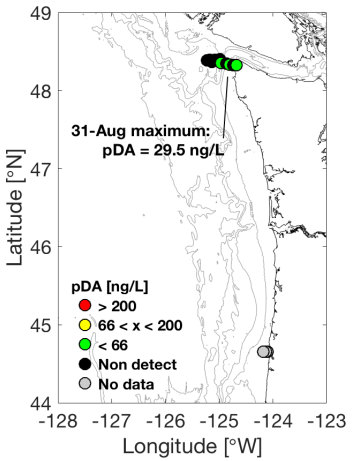



## Offshore Sampling

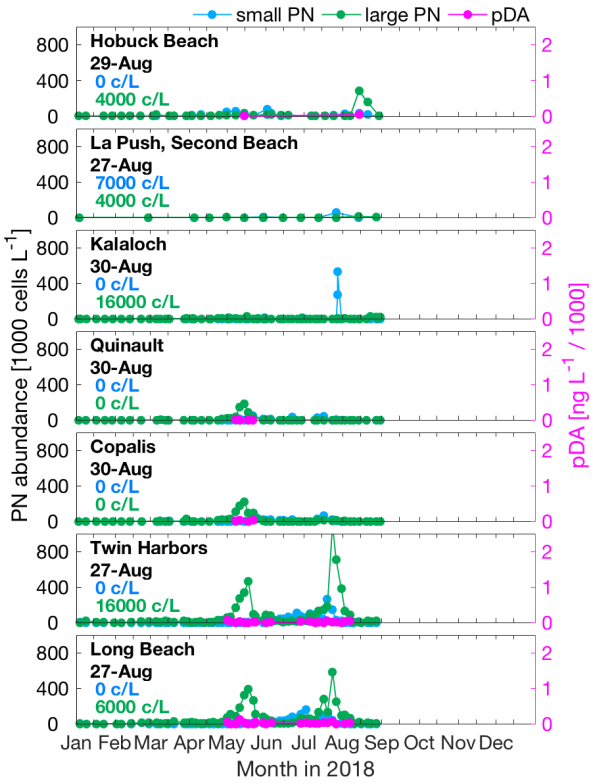
(*Pseudo-nitzschia*)



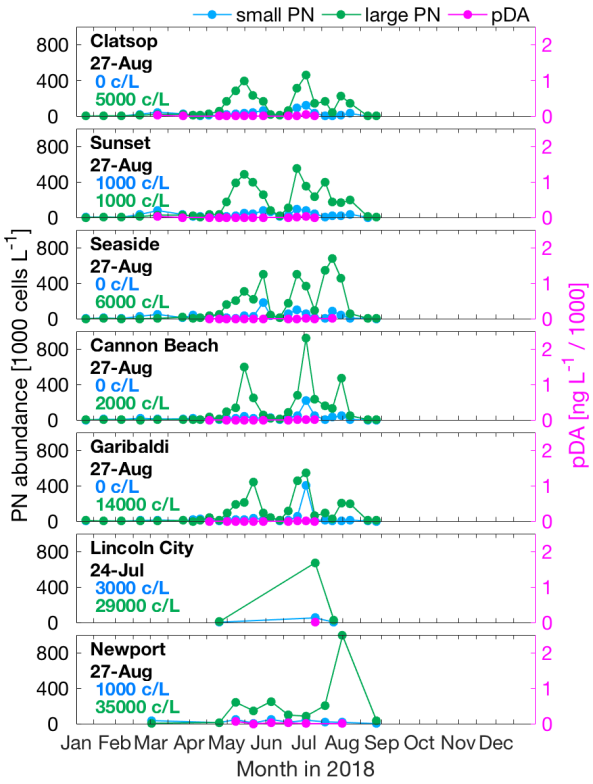

(particulate domoic acid)




## WA *Pseudo-nitzschia* & domoic acid



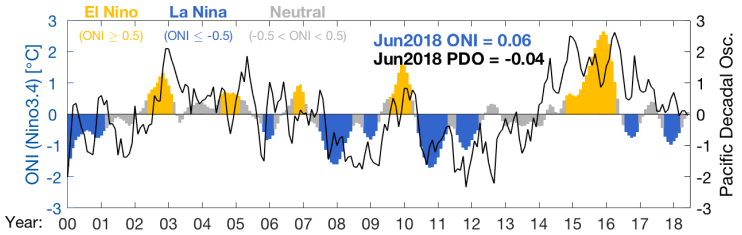

## OR *Pseudo-nitzschia* & domoic acid




*Pseudo-nitzschia* (*PN*) abundances are quantified for large and small cell morphologies using light microscopy. Threshold values: 50,000 cells/L for large *PN*; 1,000,000 cells/L for small *PN*; which trigger additional testing for seawater particulate domoic acid (pDA). Seawater pDA values >200 ng/L 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; *low:* < 1/3 threshold) and pDA, are shown in the upper left two panels. "*No data*" 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.

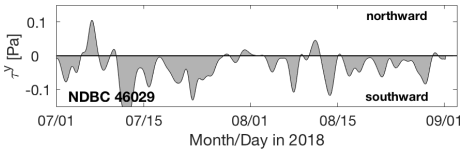
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health and the Oregon Department of Agriculture after measuring toxin levels in shellfish collected from each beach (WA link; OR link), and not from the information presented here. However, the 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



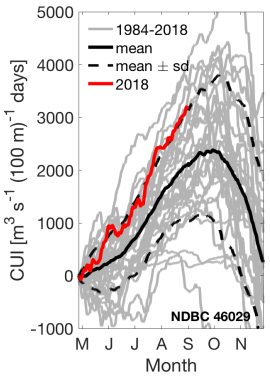

Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

## North-south wind stress

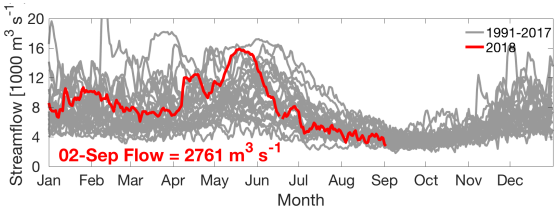



Southward wind stress drives coastal upwelling that can lead to plankton blooms. Northward wind stress tends to push any existing offshore plankton and toxins towards beaches. In addition, summer/fall toxic blooms often occur in years with a moderate cummulative upwelling index (i.e. during years with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

## Cumulative Wind Stress




## Columbia River Discharge



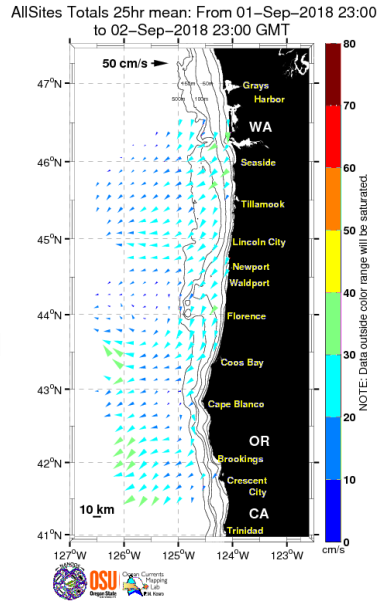

The Columbia River plume can help transport HABs and toxins from the south, northward along the WA coast. However, the plume can also serve as a protective barrier by preventing offshore toxins from reaching beaches.

## Marine Weather Forecast


Tues - NW wind, 10 kt
Wed - NW wind, 10 kt
Thur - W wind, 15 kt
Fri - S wind, 10 kt

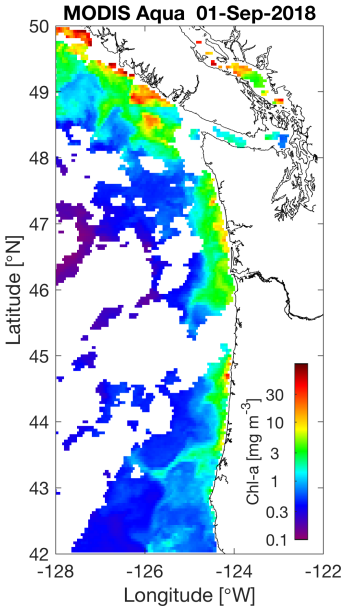
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

## Ocean Surface Currents



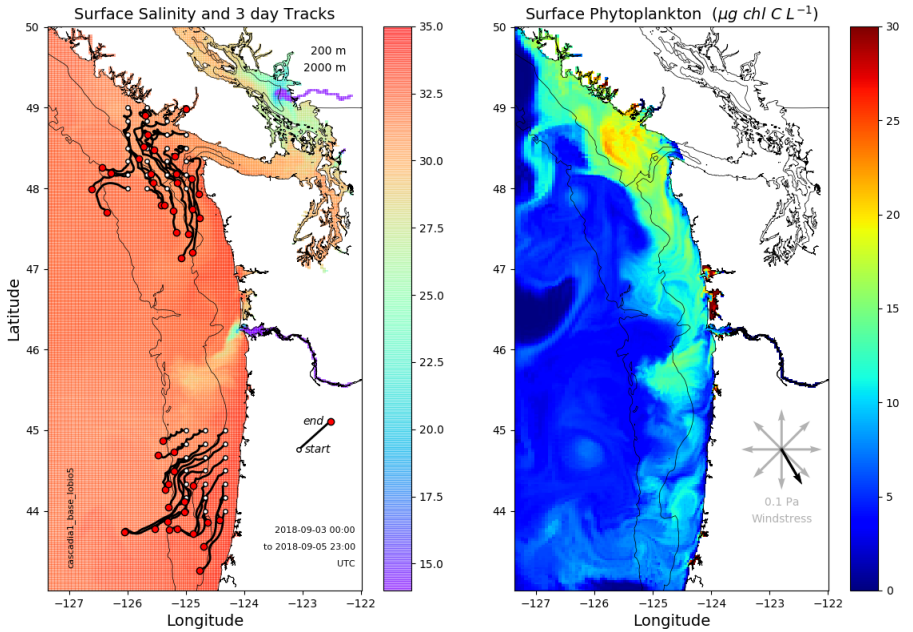

Primary currents flow north and south in winter and summer, respectively, except within ~10 km of shore, where fluctuations follow changes in wind direction.

## 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*** - Predominantly southward winds continue to force upwelling and offshore/southward surface ocean currents. Highest concentrations of chlorophyll-*a* in satellite images remain near the coast; the LiveOcean model suggests elevated chlorophyll-*a* also exists near the Juan de Fuca Eddy and the Columbia River mouth. The majority of beach samples in both WA and OR indicate that *Pseudo-nitzschia* (*PN*) abundances have decreased substantially over the last couple of weeks (e.g., 16,000 cells/L of large cell *PN* at Twin Harbors, WA, on 27 Aug; and 35,000 cells/L of large cell *PN* at Newport, OR, on 27 Aug). The one exception was a 28-Aug sample from Brookings, OR, with 349,000 cells/L of large morphology *PN*. Particulate domoic acid (pDA) was low (2.6 ng/L) for the Brookings, OR, sample, and not quantified at other beach sites due to the low cell abundances. Samples collected offshore of Newport, OR, on 21-Aug had very low abundances (600 cells/L) of small type *PN*. Offshore samples collected near the Juan de Fuca Eddy on 31-Aug contained higher *PN* abundances (58,000 cells/L large cells; 45,000 cells/L small cells) and some pDA (max 29.5 ng/L) at sites on the shelf. As of 28-Aug, WA razor clam DA remains low (≤ 2 ppm) at all sites recently sampled. Razor clam samples from OR were also below regulatory limits except at Gold Beach (110 ppm); even mussels from Gold Beach contained 30 ppm DA, suggesting an ongoing DA outbreak at that site. OR razor clam harvest is currently closed south of the Coquille River (near Bandon, OR).

***Forecast*** - ENSO neutral conditions currently continue with an expectation of an El Niño beginning within the next couple of months. The PDO is also currently in a neutral state. The short-term weather forecast suggests that southward winds will continue through Thursday, possibly transitioning to northward by the week's end. The LiveOcean forecast suggests continued upwelling with southward offshore transport of surface water and plankton for the next few days. Given the recent DA outbreak in southern OR, and low to moderate pDA concentrations off northwest WA, we do recommend exercising caution during any upcoming shellfish harvests. However, conditions do not suggest that a large-scale DA outbreak is likely in the short term. Prior to Thursday, southward winds should help keep shellfish harvests safe. Additional caution is advised near the end of the week, as the possibility of northward winds increases.