



# Pacific Northwest Harmful Algal Blooms Bulletin

Oct 4, 2018 HAB risk =



HAB risk key:

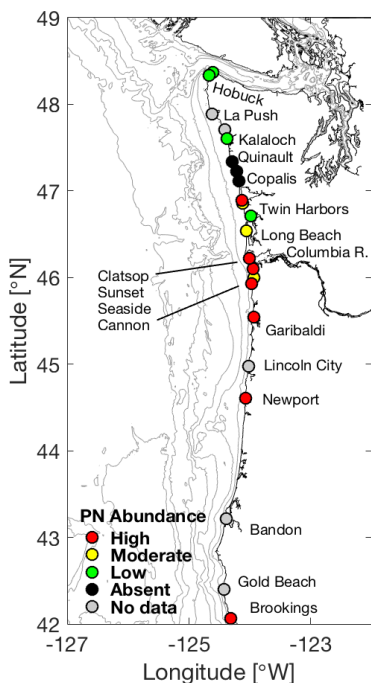
- = low
- = medium
- = high



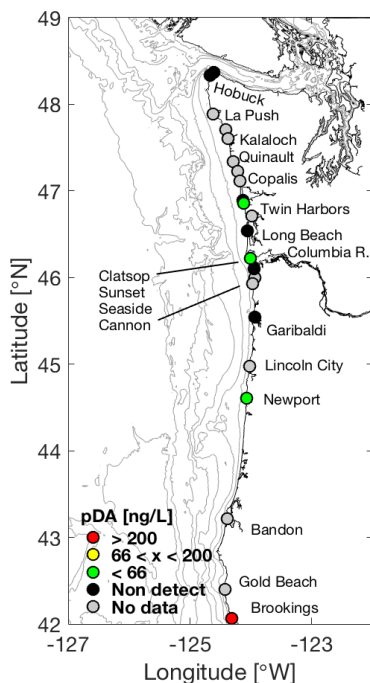
The statements, findings, conclusions, and recommendations do not necessarily reflect the views of NOAA or the Department of Commerce.

## Beach Sampling

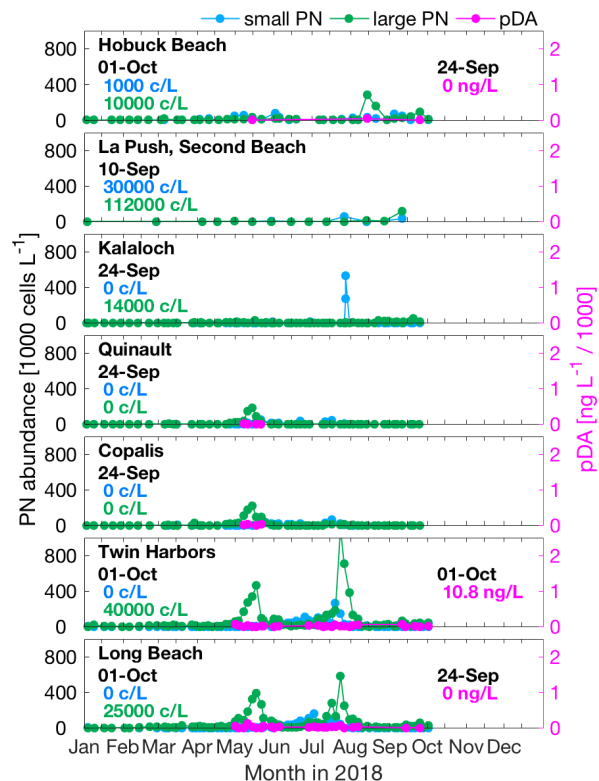
(*Pseudo-nitzschia*)



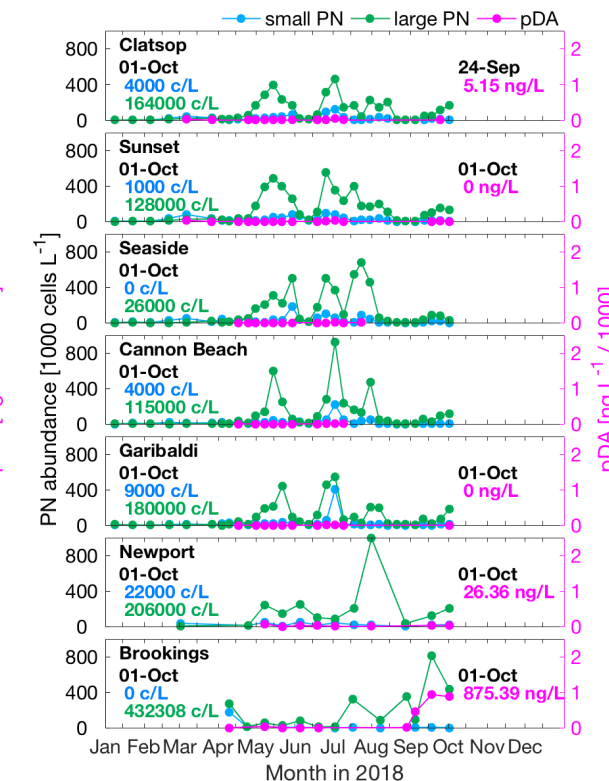
(particulate domoic acid)



## WA *Pseudo-nitzschia* & domoic acid

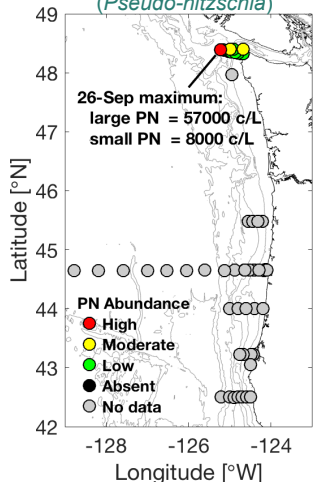


## OR *Pseudo-nitzschia* & domoic acid

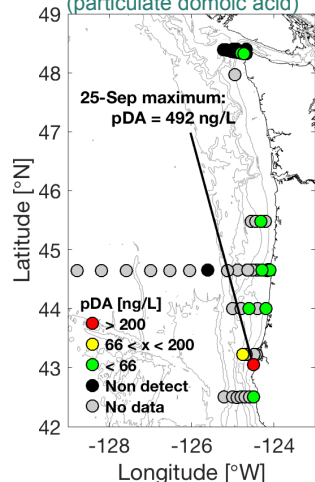


## Offshore Sampling

(*Pseudo-nitzschia*)



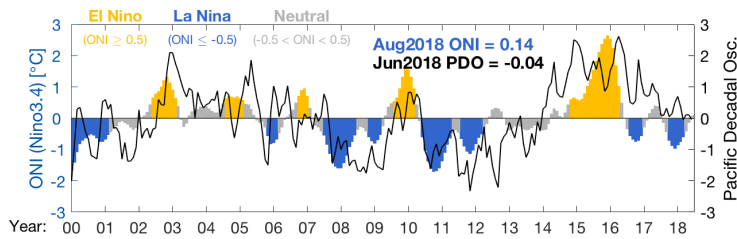
(particulate domoic acid)



*Pseudo-nitzschia* (PN) abundances are quantified for large and small cell morphologies using light microscopy. Threshold values: 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.

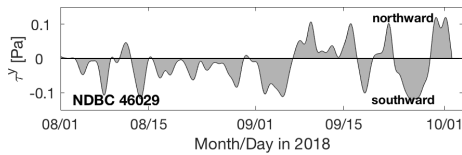
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health, the Oregon Department of Agriculture, and Coastal Treaty Tribes after measuring toxin levels in shellfish collected from each beach (WA link; OR link), and not from the information presented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



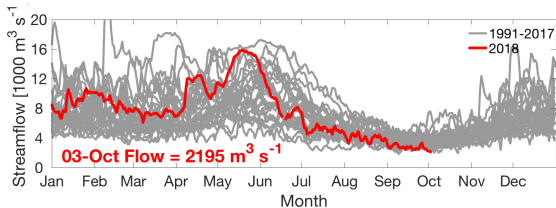
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

## 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 cumulative upwelling index (i.e. during years with fluctuating winds) rather than in years with sustained upwelling or downwelling winds.

## 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.

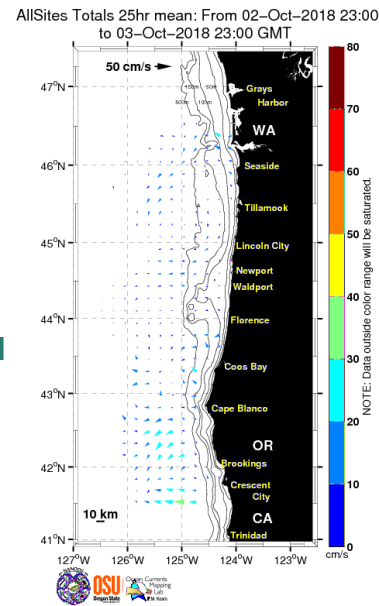
## Marine Weather Forecast



Fri - SE wind, 20 kt  
Sat - N wind, 20 kt  
Sun - NW wind, 10 kt  
Mon - N wind, 15 kt

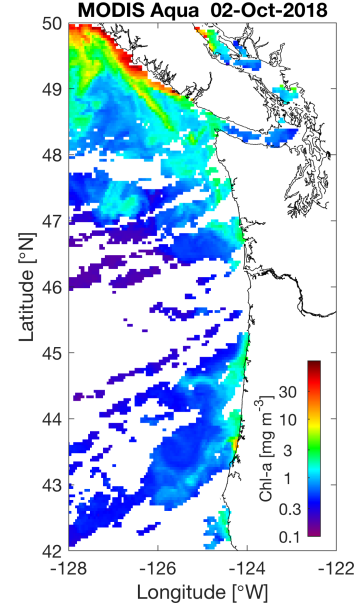
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

## Ocean Surface Currents



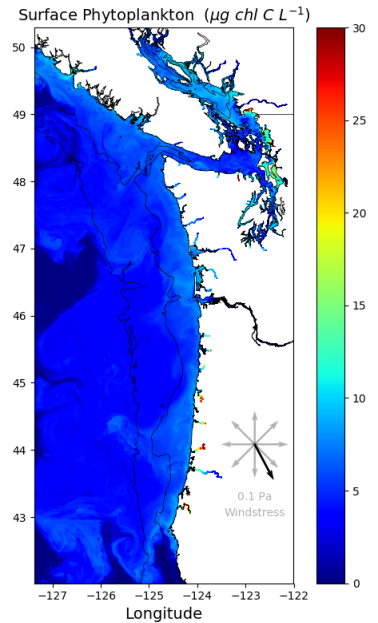
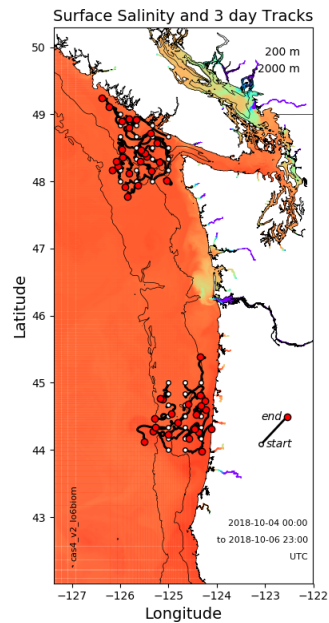
Primary currents flow north and south in winter and summer, respectively, except within ~10 km of shore, where fluctuations follow changes in wind direction.

## 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** - Fluctuating winds over the last two weeks have led to continued phytoplankton blooms near the coast and variability in observed *Pseudo-nitzschia* (PN) abundances. Both WA and OR beaches have PN abundances over the action limits. The highest recent values were in northern WA (Neah Bay: 795,000 cells/L large morphology PN on 24-Sep) and throughout OR on 1-Oct (Newport: 206,000 cells/L large PN; Brookings: 432,300 cells/L large PN). Where sampled, particulate domoic acid (pDA) at beaches and offshore has generally been low (< 27 ng/L) or undetectable; exceptions were on 25-Sep near Bandon, OR (492 ng/L), Brookings, OR (875 ng/L), and Humboldt, CA (> 800 ng/L). Offshore samples collected near the Juan de Fuca Eddy, WA, by ship and autonomous vehicle on 26-Sep contained large morphology PN cells and low pDA at sites over the shelf (max 24.8 ng/L). These samples and the 24-Sep Neah Bay and Hobuck Beach samples were confirmed by scanning electron microscopy (SEM) to be comprised primarily of *P. heimii*, with *P. delicatissima* present. SEM analyses of samples collected by a NOAA research vessel from 20-28 Sep confirmed *P. delicatissima* off Newport, OR, and *P. australis* dominant off Bandon, OR, and Humboldt, CA. As of 27-Sep, WA razor clam DA remains ≤ 2 ppm at all sites. OR razor clam DA was < 8 ppm at Coos Bay North Jetty and Newport sites, and was 11 ppm at Siuslaw Beach (near Florence, OR). OR razor clam harvest remains closed from the CA border to the Umpqua River (near Coos Bay, OR).

**Forecast** - ENSO neutral and PDO neutral conditions continue. A weak El Niño is expected by winter. The short-term weather forecast suggests that a significant storm with northward winds will move through the region Friday. Winds will then return to predominantly southward but with short northward reversals possible Sunday and Monday. Friday's storm will force surface water and any plankton/toxins northward and towards beaches, as illustrated in the LiveOcean forecast. Given the fluctuating winds and late summer season, the upwelled nutrient supply is likely diminishing - conditions that could favor toxin production. Since phytoplankton communities can transition rapidly, and because toxigenic species are present off southern OR, caution and diligent monitoring is recommended, particularly in OR. Friday's storm is unlikely to transport southern OR plankton as far north as WA. Nevertheless, we also recommend caution for upcoming harvests in WA.