



# Pacific Northwest Harmful Algal Blooms Bulletin

Sep 20, 2019 HAB risk =

HAB risk key:

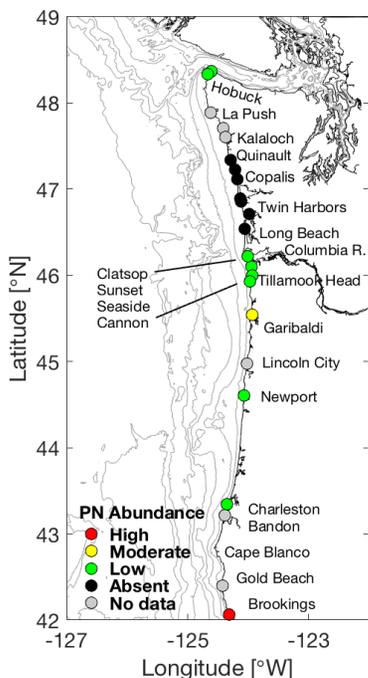
- = low
- = medium
- = high



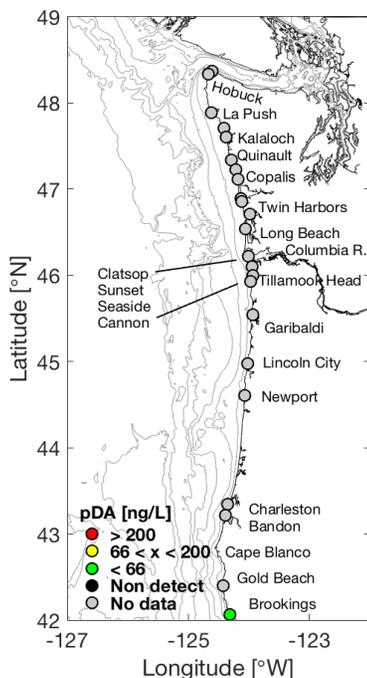
The statements, findings, conclusions, and recommendations do not necessarily reflect the views of NOAA or the Department of Commerce.

## Beach Sampling

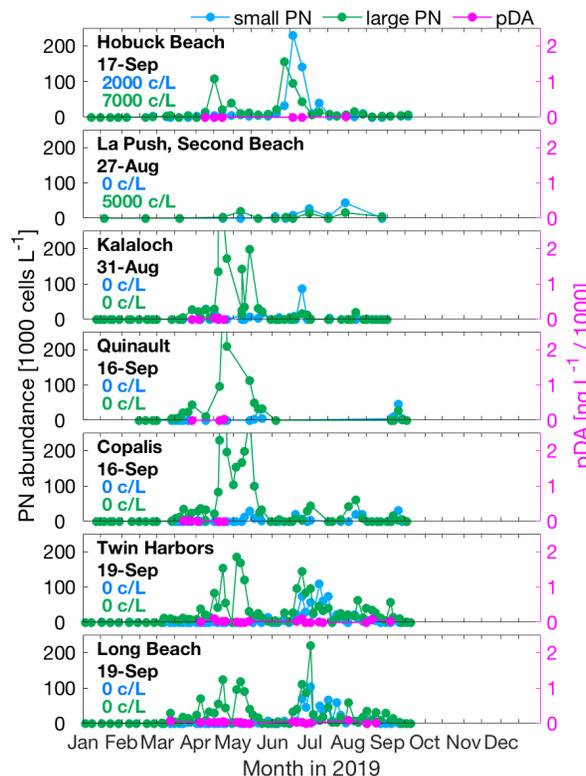
(*Pseudo-nitzschia*)



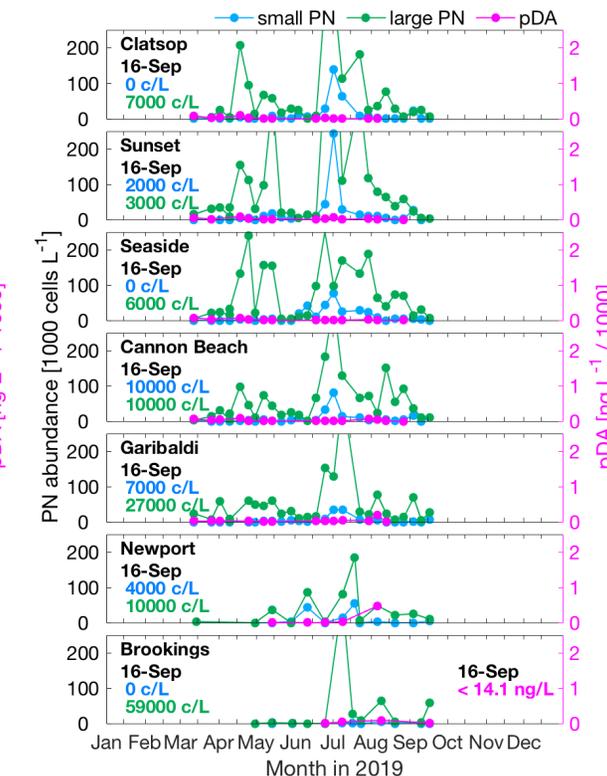
(particulate domoic acid)



## WA *Pseudo-nitzschia* & Domoic Acid

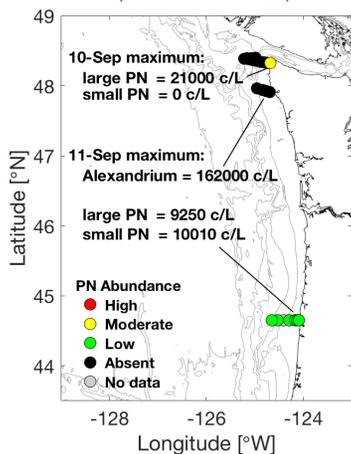


## OR *Pseudo-nitzschia* & Domoic Acid

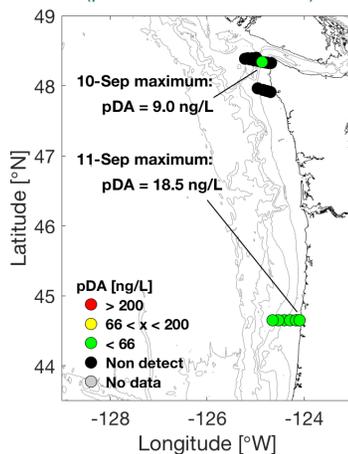


## Offshore Sampling

(*Pseudo-nitzschia*)



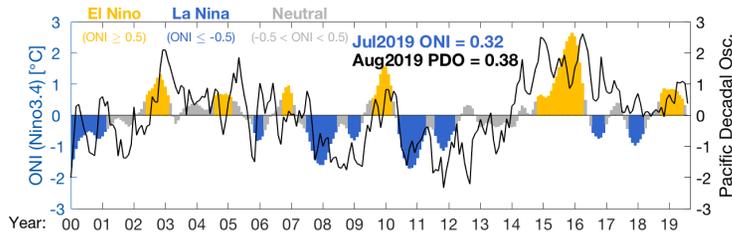
(particulate domoic acid)



*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; < 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.

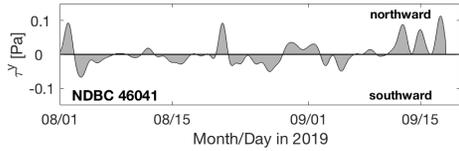
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health, the Oregon Department of Agriculture, and Coastal Treaty Tribes after measuring toxin levels in shellfish collected from each beach (WA [link](#); OR [link](#)), and not from the information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



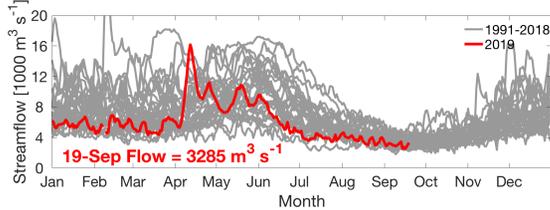
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

## 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



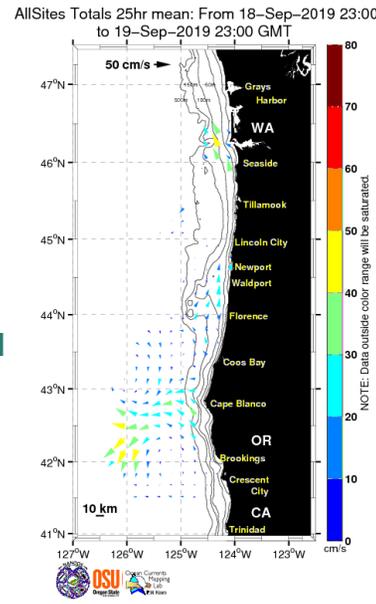
The Columbia River plume can help transport HABs and toxins from the south, northward along the WA coast. However, the plume can also serve as a protective barrier by preventing offshore toxins from reaching beaches.

## Marine Weather Forecast



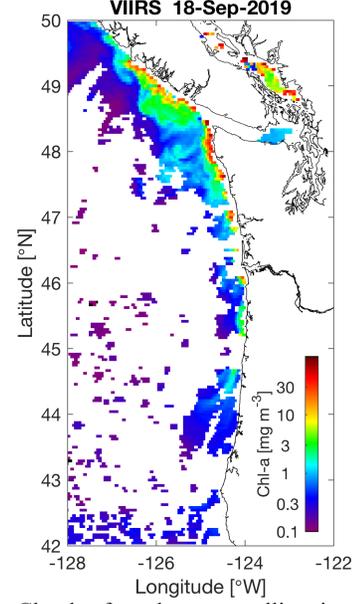
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

## 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.

**Summary** - Weak upwelling-favorable winds continued in early September. Recent storms have led to downwelling-favorable conditions with limited satellite views, but elevated chlorophyll is evident off northern WA. Currents are northward near the coast, but remain southward offshore of the shelf break. Recent *Pseudo-nitzschia* (*PN*) abundances in WA and OR have been low. Highest cell counts have been off northern WA on 10-Sep (Neah Bay: 43,000 cells/L of large *PN*); central WA on 9-Sep (Quinalt: 45,000 cells/L small *PN*); and southern OR on 16-Sep (Brookings: 59,000 cells/L large *PN*). Seawater particulate domoic acid (pDA) was <14.1 ng/L at Brookings, OR, and was not quantified at other beach sites due to low *PN* abundance. Samples collected 10-Sep offshore of northern WA had 21,000 cells/L of large *PN* at the near shore site only. A shelf-break site had 9 ng/L pDA, but no detectable *PN*. Samples collected offshore of La Push, WA, on 11-Sep contained no *PN* or pDA, but notably had up to 162,000 cells/L of *Alexandrium* near shore. Samples collected offshore of Newport, OR, on 11-Sep had low *PN* abundances and pDA, with the highest values near shore (~10,000 cell/L of both large and small *PN*; 18.5 ng/L pDA). Scanning electron microscopy of this near shore sample revealed *P. pseudodelicatissima*, *P. cuspidata*, and *P. fraudulenta* / *P. heimii*. Razor clam samples from WA beaches have very low DA values (<2 ppm). In OR, razor clams from Newport, Sparrow Park (north of Charleston), Cape Blanco, and Gold Beach were all <13 ppm DA as of 6-Sep. OR beaches from Tillamook Head to the Umpqua River (north of Coos Bay) and south of Bandon are open to razor clam harvest.

**Forecast** - ENSO neutral conditions are expected to persist through autumn and into winter. The PDO index is weakly positive. Recent shorter-term sea surface temperature (SST) anomalies have illustrated particularly warm water in the region. Northward winds Saturday will turn southward on Sunday, as illustrated by the LiveOcean forecast, and are likely to remain predominantly upwelling-favorable throughout the coming week. The longer-term forecast does suggest the possibility of a weak northward reversal after Monday. While small toxicogenic *PN* cells are present off central OR, the overall low *PN* abundances throughout the region suggest there is low risk of a DA outbreak over the next week. However, the extremely high abundances of *Alexandrium* off northern WA, high SST, and expected upwelling require continued caution and diligent monitoring for safety.

## LiveOcean Forecast Model

