



# Pacific Northwest Harmful Algal Blooms Bulletin

Oct 25, 2017 HAB risk =

HAB risk key:

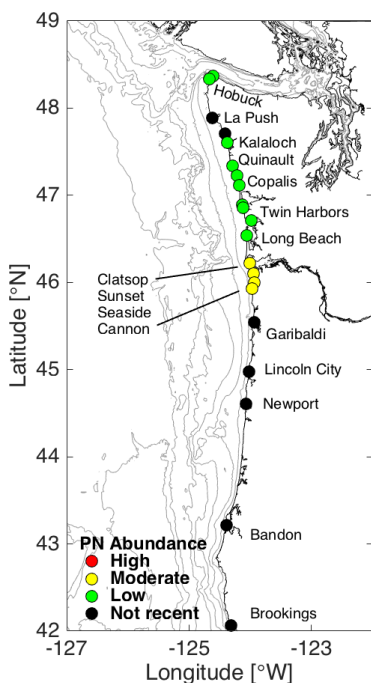
- = low
- = medium
- = high



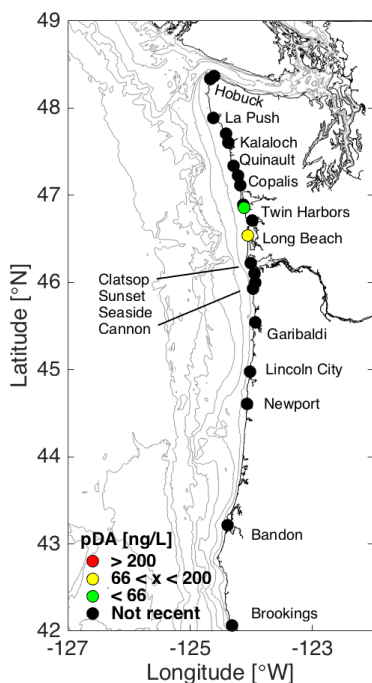
The statements, findings, conclusions, and recommendations do not necessarily reflect the views of NOAA or the Department of Commerce.

## Beach Sampling

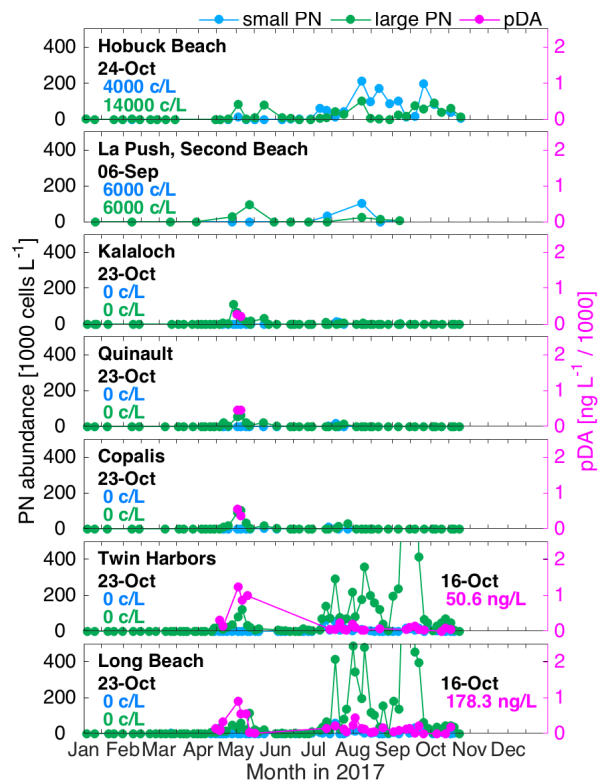
(*Pseudo-nitzschia*)



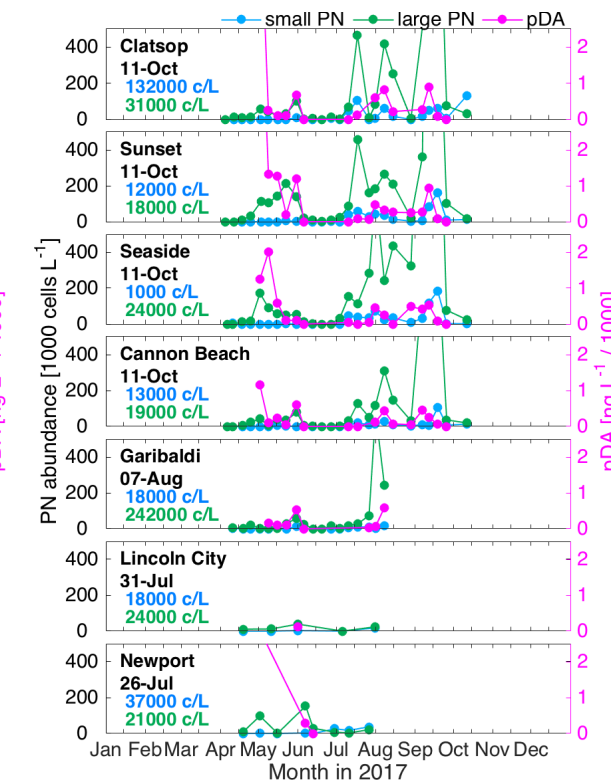
(particulate domoic acid)



## WA *Pseudo-nitzschia* & domoic acid

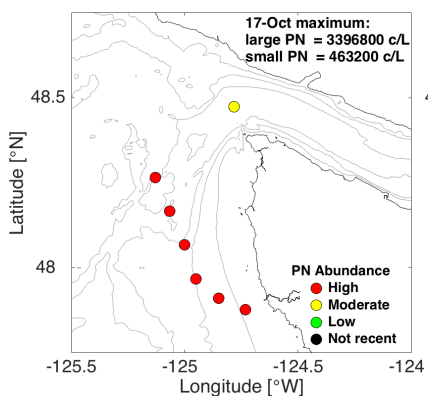


## OR *Pseudo-nitzschia* & domoic acid

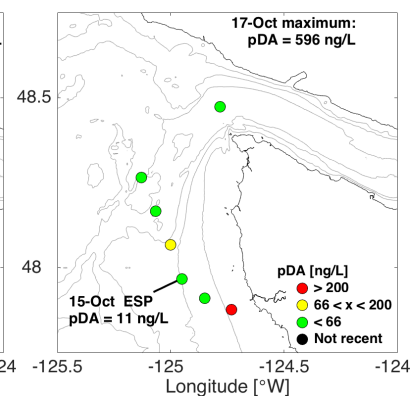


## Offshore Sampling

(*Pseudo-nitzschia*)



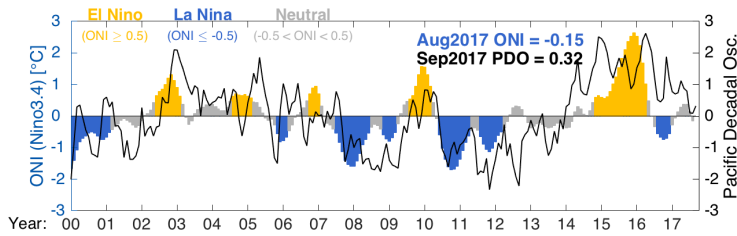
(particulate domoic acid)



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

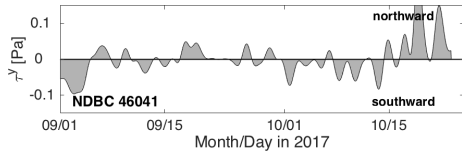
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health and the Oregon Department of Agriculture after measuring toxin levels in shellfish collected from each beach (WA [link](#); OR [link](#)), and not from the information presented here.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



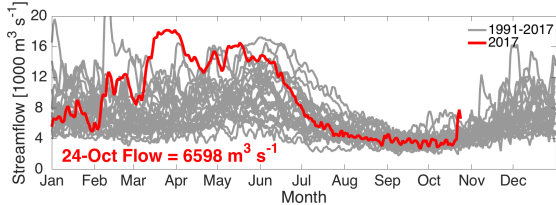
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

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

## Columbia River Discharge



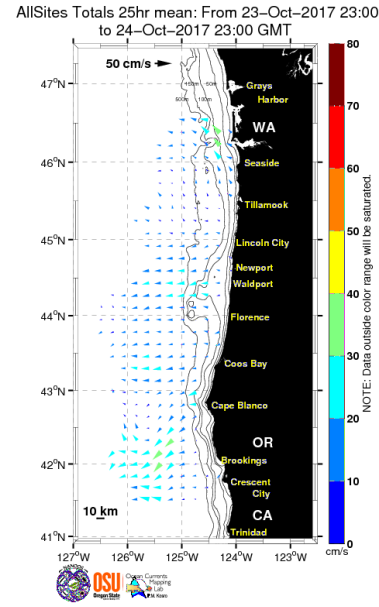
The Columbia River plume can help transport HABs and toxins from the south, northward along the WA coast. However, the plume can also serve as a protective barrier by preventing offshore toxins from reaching beaches.

## Marine Weather Forecast



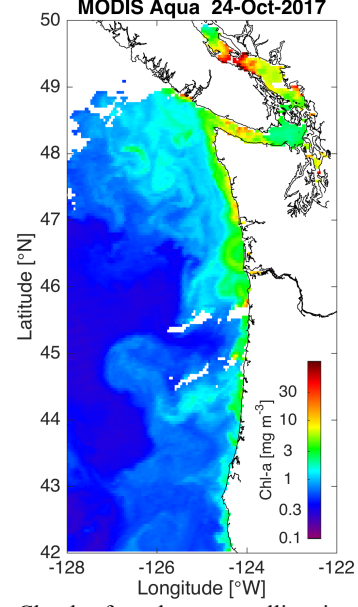
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

## 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.

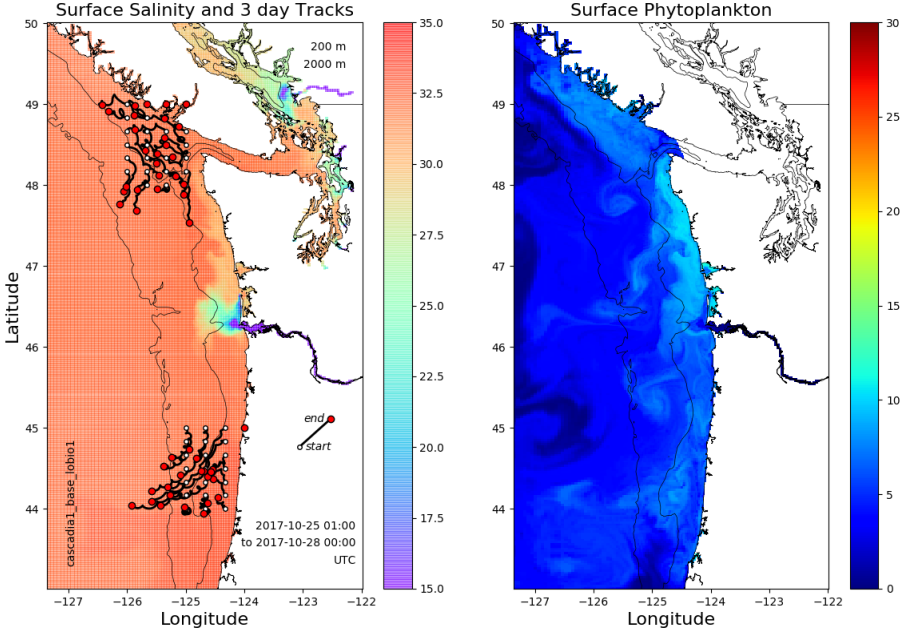
## Satellite Chlorophyll-a



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** - *Pseudo-nitzschia* (PN) abundances at beaches in both WA and northern OR have greatly decreased since mid-September. However, water column particulate domoic acid (pDA) was recently elevated in southern WA with values as high as 178 ng/L at Long Beach on 16-Oct. Samples collected from the ESP recovery cruise off northern WA on 17-Oct indicated extremely high abundances of large-type PN cells (3,396,800 cells/L) and significant abundances of small-type cells (463,200 cells/L). Offshore pDA during this cruise was generally <75 ng/L except at a site near La Push where values were high (596 ng/L). Scanning electron microscope analyses indicated a predominance of *P. heimii*, a weakly toxic species, at both offshore and nearshore sites, with toxigenic species *P. australis*, *P. multiseriata*, and *P. pseudodelicatissima* present in lower amounts. Recent razor clam DA samples in WA were below the 20 ppm limit. WDOH reported the highest values at Quinalt (7 ppm on 16-Oct) and Long Beach (10 ppm on 17-Oct). Samples from other WA beaches were all <7 ppm as of 16-Oct. Razor clams from Clatsop Beach, OR, were at 15 ppm on 12-Oct, but samples south of Cascade Head (central OR) remain >20 ppm. Elevated DA in crabs from southern OR has led to closures of the recreational and commercial crab fisheries south of Bandon.

## 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.

**Forecast** - Current ENSO conditions are neutral, and a weak La Niña is now favored for this fall and winter. The PDO remains weakly positive. After a weak front passes today, the short-term weather forecast predicts primarily upwelling-favorable winds to return for the remainder of this week with the possibility of high pressure lingering into early next week. Recent substantial storms forced northward ocean currents for a few days that likely eroded upwelled density surfaces (note that shellfish samples collected after those storms could show increases in DA). Because of the weakened ocean density structure, more stagnant flows are likely this week. Such conditions are reflected in the particle track forecasts from the LiveOcean model. Thus, we anticipate nutrient depleted surface water along the coast with more limited nutrient upwelling this week, conditions that could favor toxic PN blooms. Over the next few days the perceived risk is low. However, since recent offshore samples indicated the continued presence of pDA and toxigenic PN species, we advise additional caution particularly following any upcoming northward wind reversals or relaxations.