Pacific Northwest Harmful Algal Blooms Bulletin

Oct 19, 2019 HAB risk = ✖

HAB risk key:

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

JISAO Joint Institute for the Study of the Atmosphere and Ocean

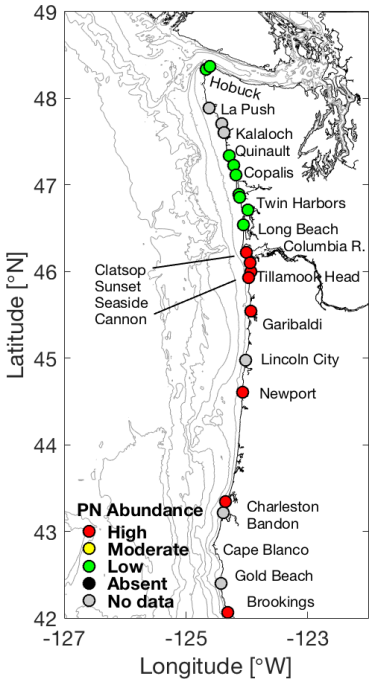
School of Oceanography, University of Washington

ORHAB Partnership — Oregon Harmful Algal Bloom

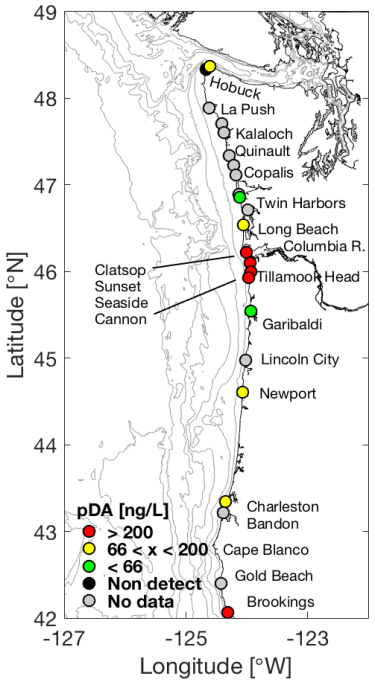
The statements, findings, conclusions, and recommendations do not necessarily reflect the views of NOAA or the Department of Commerce.

Beach Sampling

(*Pseudo-nitzschia*)

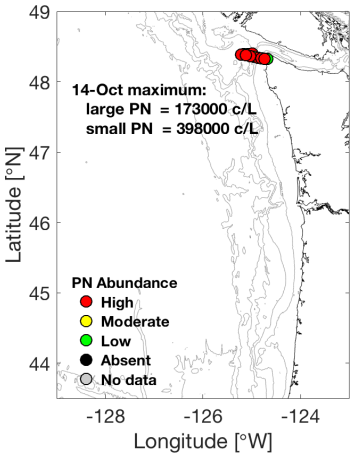


(particulate domoic acid)

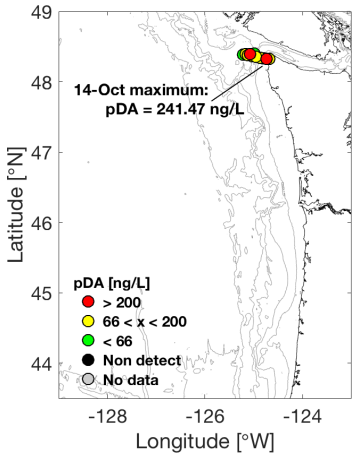


Offshore Sampling

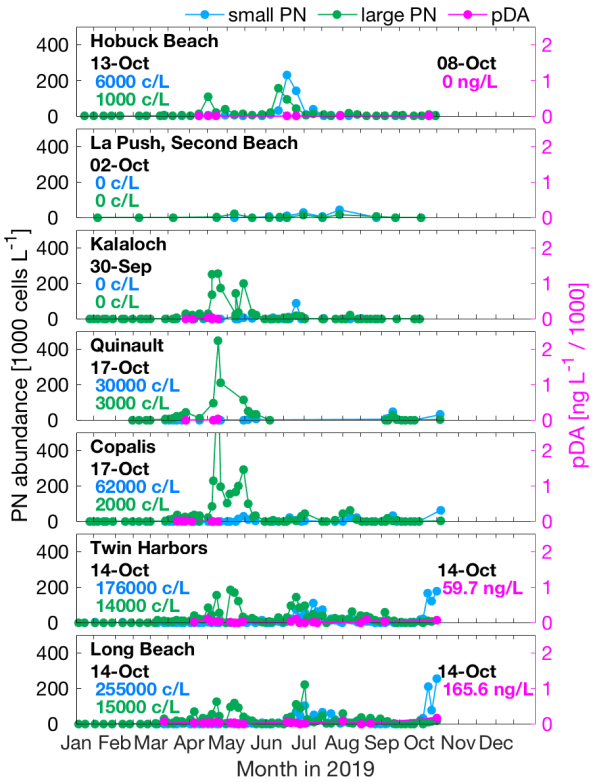
(*Pseudo-nitzschia*)



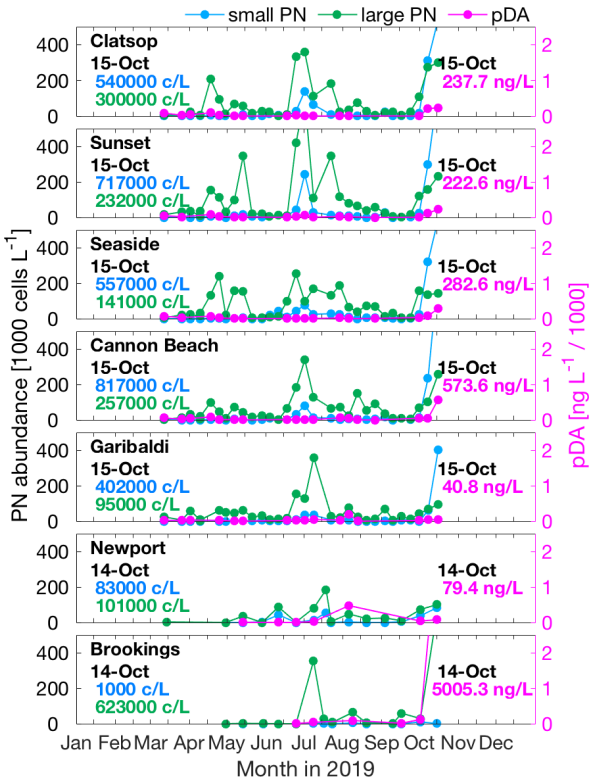
(particulate domoic acid)



WA *Pseudo-nitzschia* & Domoic Acid



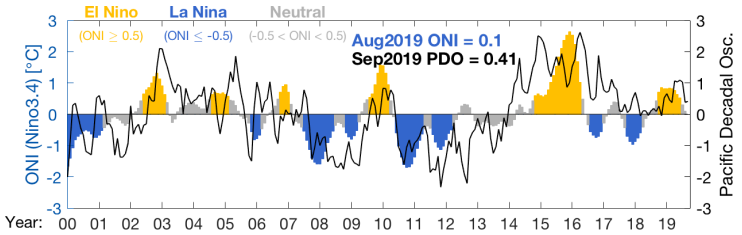
OR *Pseudo-nitzschia* & Domoic Acid



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.

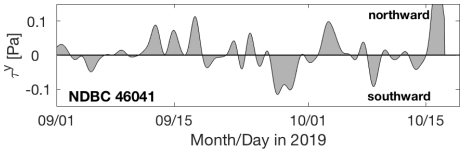
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health, the Oregon Department of Agriculture, and Coastal Treaty Tribes after measuring toxin levels in shellfish collected from each beach (WA link; OR link), and not from the information presented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



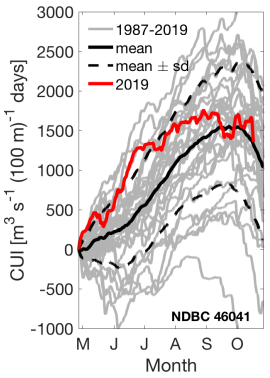
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

North-south Wind Stress

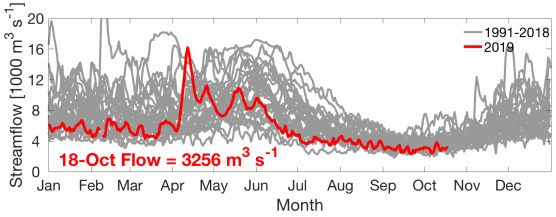


Southward wind stress drives coastal upwelling that can lead to plankton blooms. Northward wind stress tends to push any existing offshore plankton and toxins towards beaches. In addition, summer/fall toxic blooms often occur in years with a moderate cummulative upwelling index (i.e. during years with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

Cumulative Wind Stress

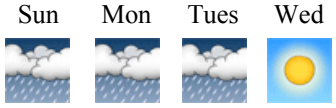


Columbia River Discharge



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.

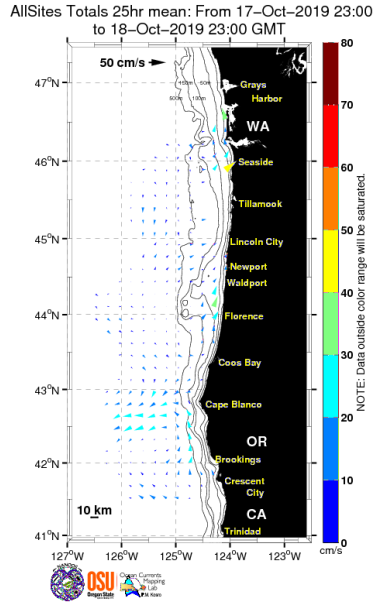
Marine Weather Forecast



Sun - SW wind, 20 kt
Mon - SW wind, 20 kt
Tues - NW wind, 15 kt
Wed - N wind, 10 kt

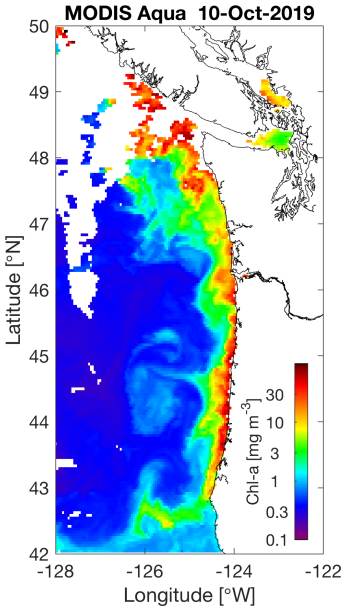
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

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.

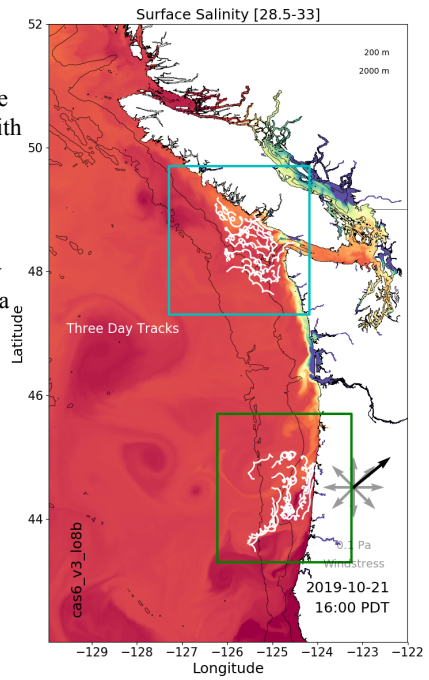
Satellite Chlorophyll-*a*

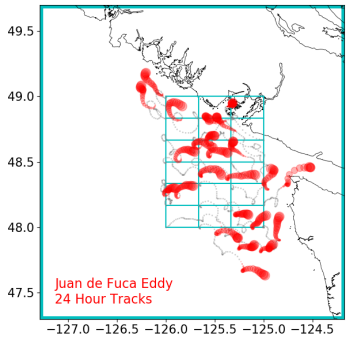


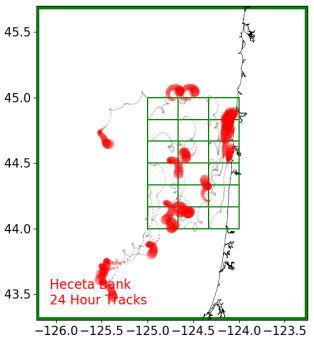
Clouds often obstruct satellite views, but the extent of phytoplankton blooms can at times be seen from space. Blooms do not necessarily reflect the presence of toxins.

LiveOcean Forecast Model

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







Summary - Fluctuating winds and predominantly upwelling-favorable, southward currents helped to maintain coastal phytoplankton blooms throughout early October. Elevated chlorophyll-*a* is evident in the available satellite images. More recently, the first of a series of fall storms has started impacting the region. Recent large and small cell morphologies of *Pseudo-nitzschia* (*PN*) in WA and OR have increased substantially. Highest cell counts in WA were on 14-Oct (Long Beach: 255,000 cells/L small *PN*). Cell counts were also high in northern OR on 15-Oct (Clatsop: 300,000 cells/L large *PN*, 540,000 small *PN*; Cannon Beach: 257,000 cells/L large *PN*, 817,000 cells/L small *PN*). Large *PN* cells were dominant in southern OR (Brookings: 623,000 cells/L large *PN* compared to 1,000 cells/L small *PN*). Seawater particulate domoic acid (pDA) was 154 ng/L at Neah Bay, WA, on 8-Oct; and 283 ng/L at Seaside, OR, and 574 ng/L at Cannon Beach, OR, on 15-Oct. At Brookings, OR, pDA was extremely high, 5005 ng/L, on 15-Oct. Samples collected 14-Oct offshore of northern WA contained large quantities of both large and small *PN* at all sites (up to 173,000 cells/L of large *PN* and 398,000 cells/L of small *PN*), with pDA ranging from 52.1–241.5 ng/L. At some of those sites, *PN* comprised as much as 70% of the phytoplankton population. Razor clam samples from WA beaches have low DA values (≤5 ppm), but samples collected from southern WA beaches on 15-Oct have started to show increases (from 2 to 5 ppm). In OR, razor clams from near Coos Bay have the highest DA levels (17 ppm on 4-Oct) in recent analyses.

Forecast - ENSO neutral conditions are expected to persist through autumn and into winter. The PDO index is weakly positive. Onshore winds Saturday will turn northward on Sunday, and are likely to remain predominantly northward through Monday as a series of fall storms impacts the region. This will continue to force phytoplankton and toxins shoreward, as illustrated by the LiveOcean forecast. The longer-term weather forecast suggests that beyond Tuesday, upwelling-favorable conditions may return for a few days. Given the recent high abundances of *PN* at beaches and offshore of northern WA, as well as the elevated concentrations of pDA, we expect razor clams to continue accumulating toxins through at least next Tuesday. It is possible that such accumulations may end up exceeding the regulatory limits. Extreme caution and diligent monitoring are advised.