Pacific Northwest Harmful Algal Blooms Bulletin

Apr 21, 2020 HAB risk =

HAB risk key:

- = *low*
- = *medium*
- = *high*

JISAO Joint Institute for the Study of the Atmosphere and Ocean

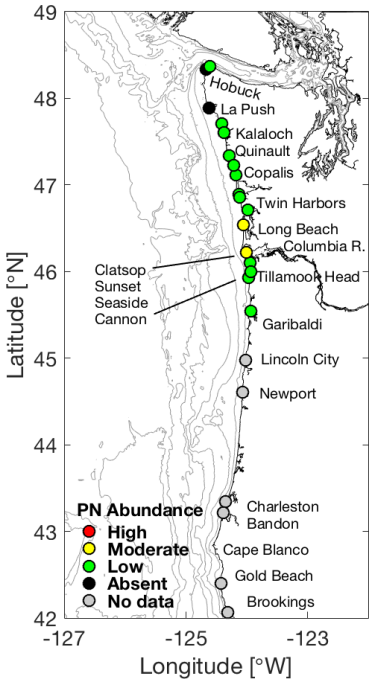
School of Oceanography, University of Washington

ORHAB Partnership

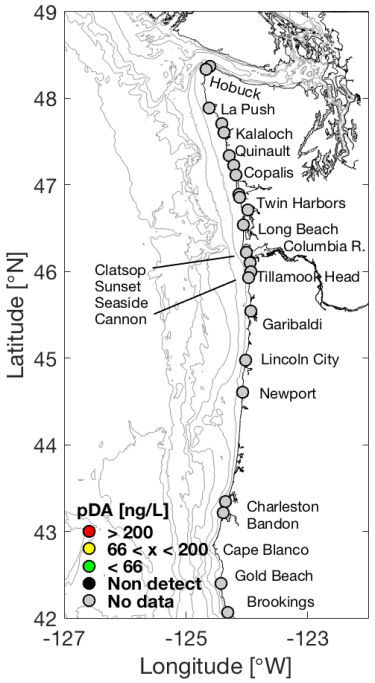
The statements, findings, conclusions, and recommendations do not necessarily reflect the views of NOAA or the Department of Commerce.

Beach Sampling

(*Pseudo-nitzschia*)

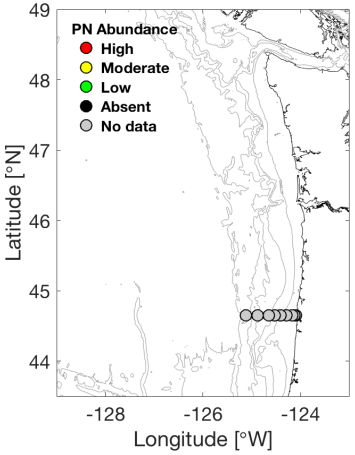


(particulate domoic acid)

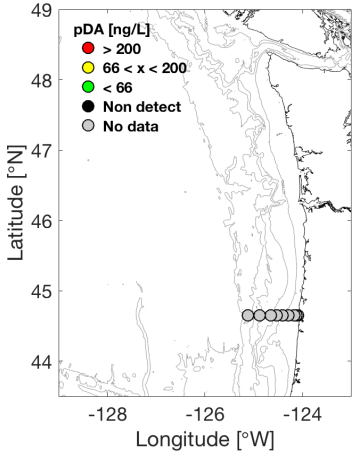


Offshore Sampling

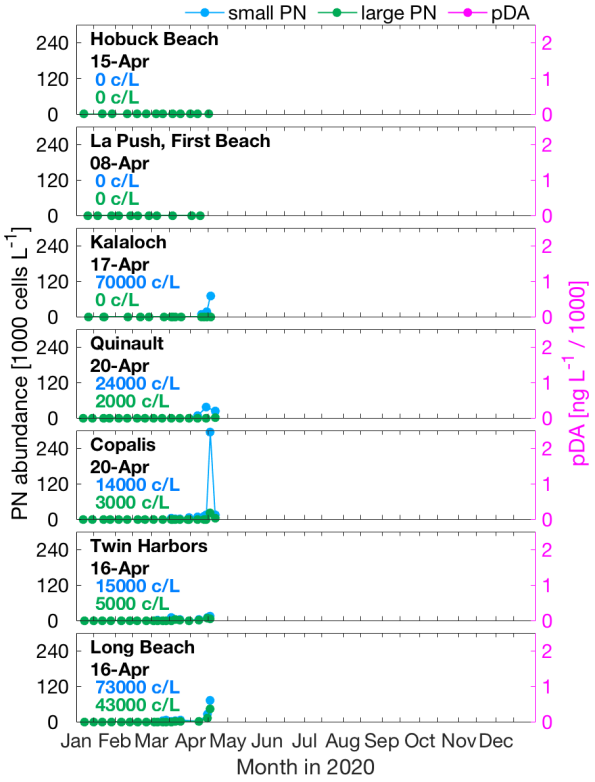
(*Pseudo-nitzschia*)



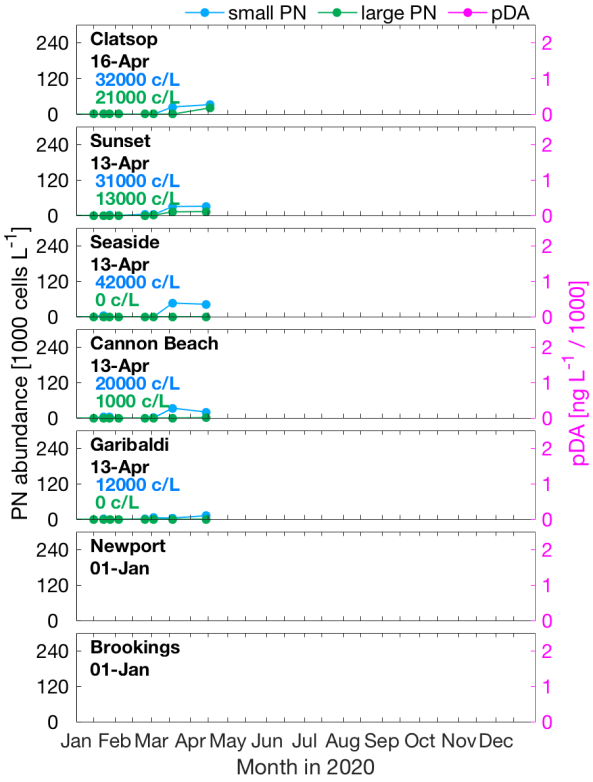
(particulate domoic acid)



WA *Pseudo-nitzschia* & Domoic Acid



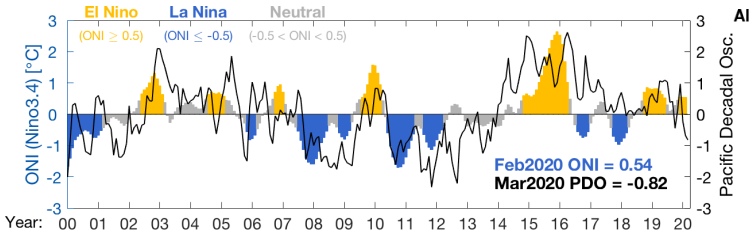
OR *Pseudo-nitzschia* & Domoic Acid



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.

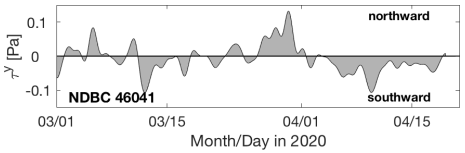
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health, the Oregon Department of Agriculture, and Coastal Treaty Tribes after measuring toxin levels in shellfish collected from each beach (WA link; OR link), and not from the information presented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



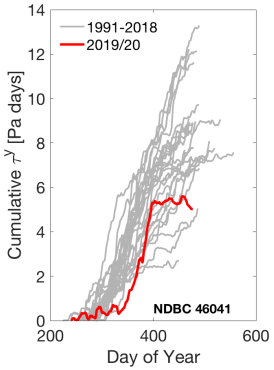
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

North-south Wind Stress

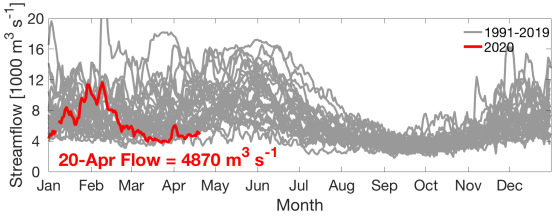


Southward wind stress drives coastal upwelling that can lead to plankton blooms. Northward wind stress tends to push any existing offshore plankton and toxins towards beaches. In addition, summer/fall toxic blooms often occur in years with a moderate cummulative upwelling index (i.e. during years with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

Cumulative Wind Stress



Columbia River Discharge



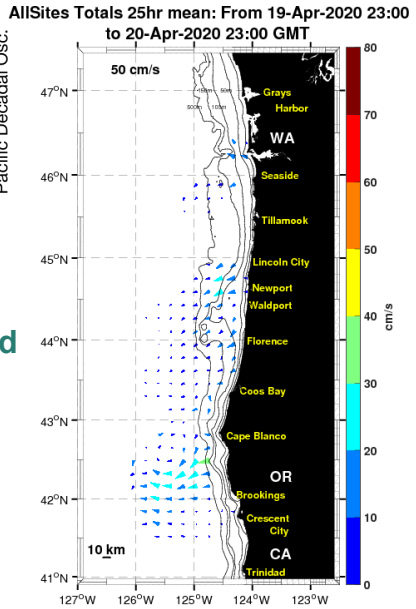
The Columbia River plume can help transport HABs and toxins from the south, northward along the WA coast. However, the plume can also serve as a protective barrier by preventing offshore toxins from reaching beaches.

Marine Weather Forecast

Wed - S wind, 15 kt
Thur - W wind, 10 kt
Fri - SE wind, 10 kt
Sat - SW wind, 15 kt

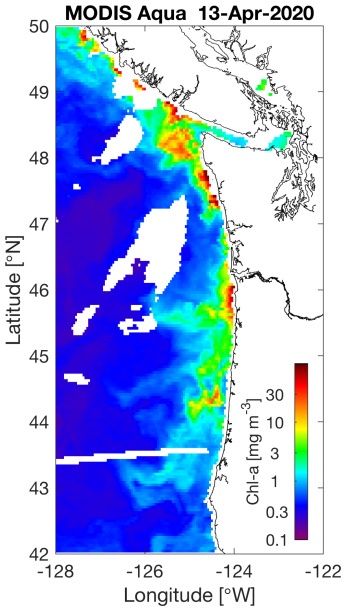
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

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.

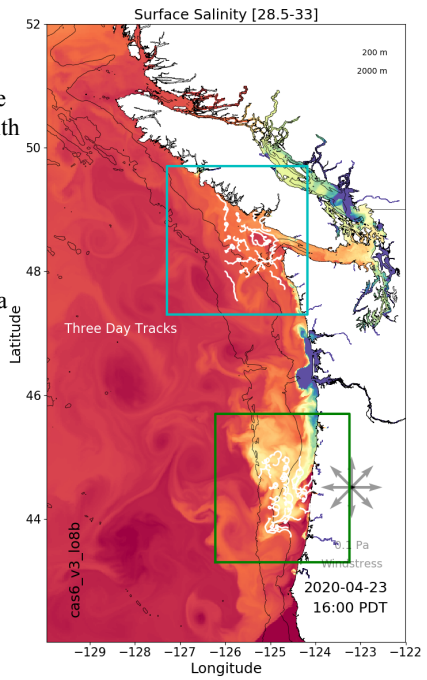
Satellite Chlorophyll-*a*

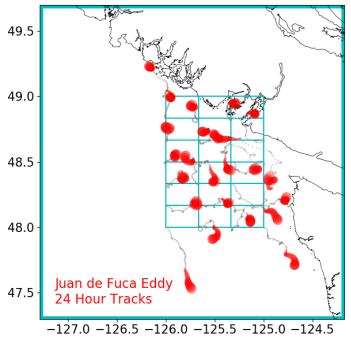


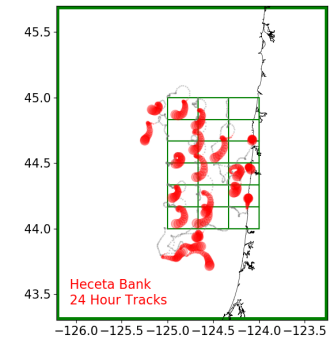
Clouds often obstruct satellite views, but the extent of phytoplankton blooms can at times be seen from space. Blooms do not necessarily reflect the presence of toxins.

LiveOcean Forecast Model

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







Summary - The first half of April brought persistent upwelling-favorable winds. These conditions along with relatively warm temperatures and clear skies have fueled phytoplankton blooms off the coast, as evident in several recent satellite images. In those snapshots the highest chlorophyll-*a* concentrations appear to be off northern and central WA, and northern and central OR. *Pseudo-nitzschia* (*PN*) cells, including both large and small morphologies, have been increasing in abundance at beaches throughout the region. In samples collected on 16-Apr, large cell *PN* were most abundant near the Columbia River (Long Beach, WA: 43,000 cells/L; Clatsop South Jetty, OR: 21,000 cells/L). Small morphology *PN* cells were also present at sites near the Columbia River on 16-Apr (Long Beach, WA: 43,000 cells/L; Seaside, OR: 42,000 cells/L), but were most abundant at central WA beaches (Copalis, WA: 294,000 cells/L; Mocrocks, WA: 240,000 cells/L; Kalaloch, WA: 70,000 cells/L). Since *PN* cell counts generally remain below threshold values, no seawater particulate domoic acid (pDA) samples have been analyzed. Similarly, no offshore samples have been collected and *PN* species identification has not been made. As of 12-Apr, WA razor clam DA concentrations remain low (≤3 ppm). In OR, razor clam DA was 9.8 ppm at Sunset Beach, and 14 ppm at Coos Bay North Jetty as of 13-Apr.

Forecast - The state of the combined ocean-atmosphere system continues to be consistent with ENSO neutral conditions. Such conditions are expected to persist through summer. The most recent PDO value is negative. Coastal winds will switch to northward Tuesday and start forcing plankton and any toxins north and onshore as indicated by the LiveOcean forecast. *PN* cells will likely continue to increase in abundance as they become concentrated at beaches during this time. The extended forecast indicates that larger spring storms may inundate the region by this weekend. Recall that no recent offshore samples were available for species identification or toxin analysis. Nevertheless, the fact that the spring transition to larger-scale upwelling appears to have occurred, combined with the prevalence of small morphology *PN* cells at many sites, suggests that any toxins are not likely to be of a sufficient concentration to result in a large or rapid outbreak. Since toxins could still exist, however, we recommend caution during this time, including diligent sampling and pDA analysis to ensure safe shellfish harvests.