Pacific Northwest Harmful Algal Blooms Bulletin

Apr 14, 2019 HAB risk = ⚠

HAB risk key:

- ✓ = *low*
- ⚠ = *medium*
- ✗ = *high*

JISAO Joint Institute for the Study of the Atmosphere and Ocean

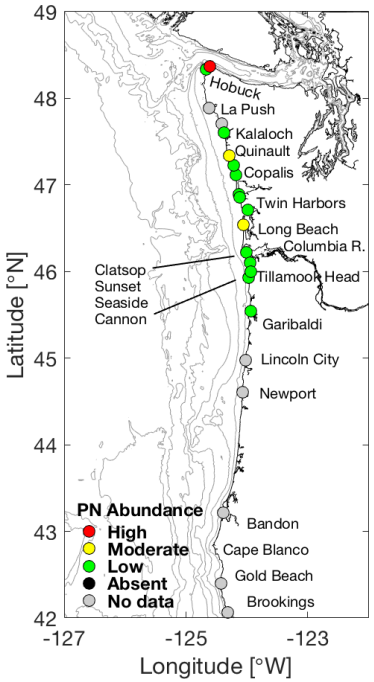
School of Oceanography, University of Washington

ORHAB Partnership

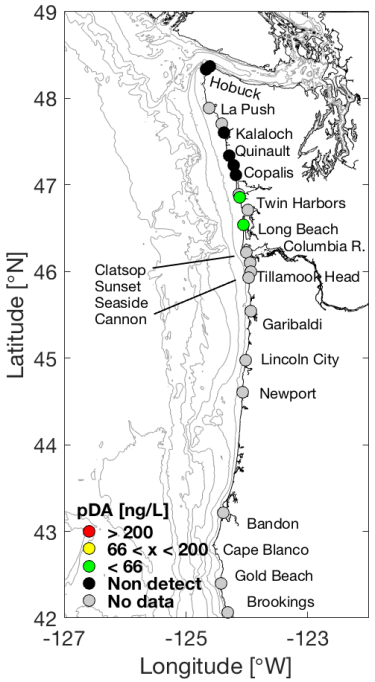
The statements, findings, conclusions, and recommendations do not necessarily reflect the views of NOAA or the Department of Commerce.

Beach Sampling

(*Pseudo-nitzschia*)

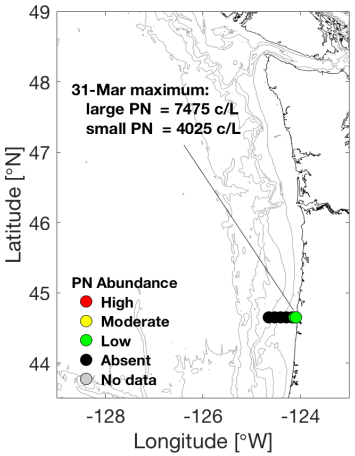


(particulate domoic acid)

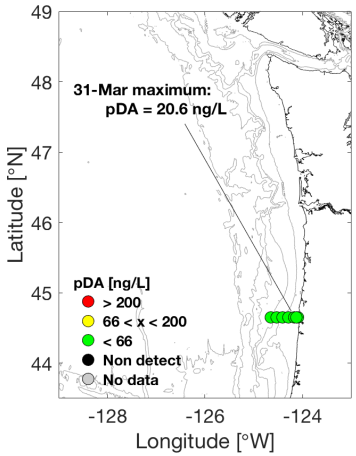


Offshore Sampling

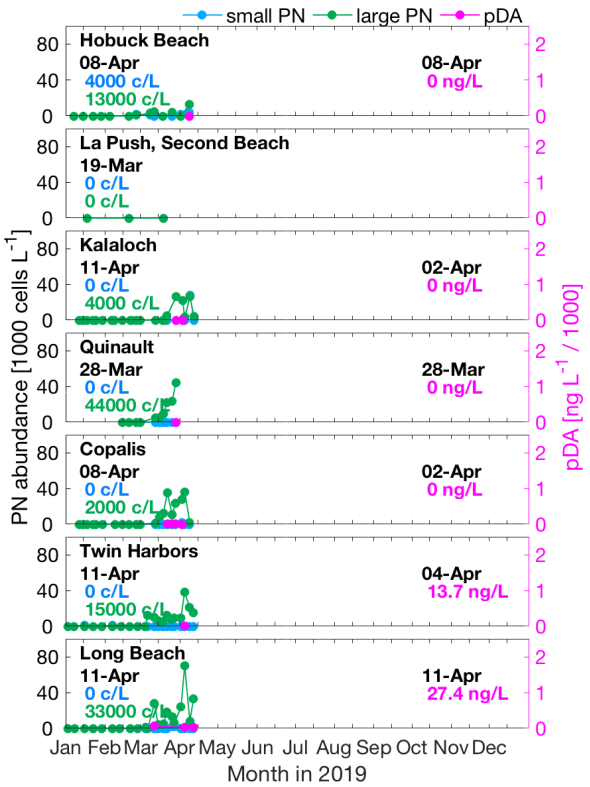
(*Pseudo-nitzschia*)



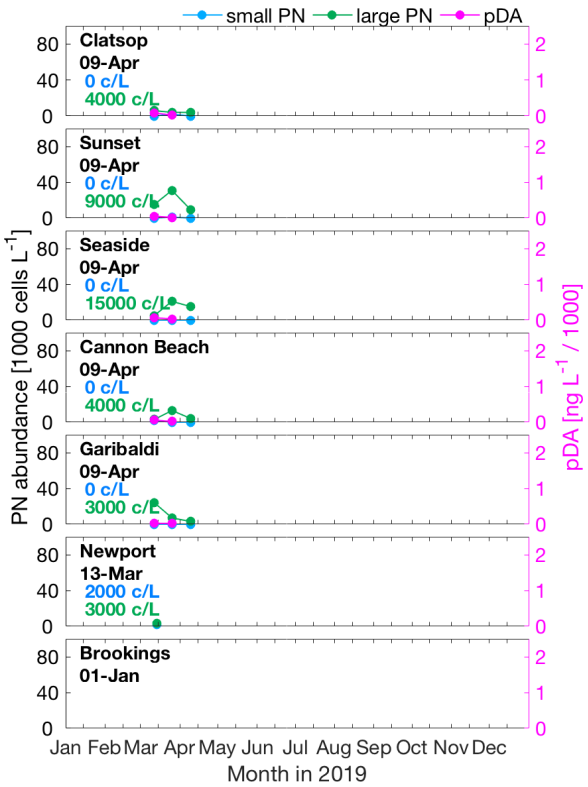
(particulate domoic acid)



WA *Pseudo-nitzschia* & Domoic Acid



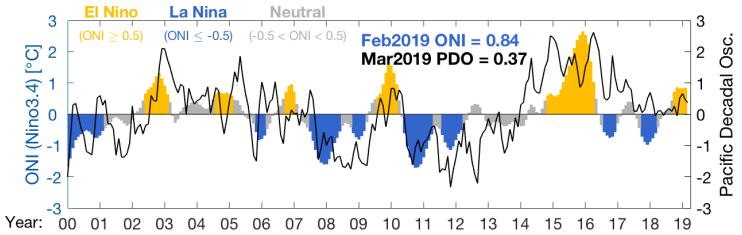
OR *Pseudo-nitzschia* & Domoic Acid



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.

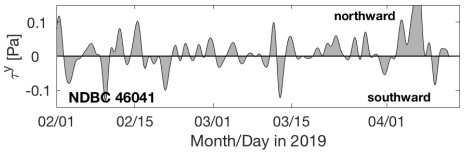
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health, the Oregon Department of Agriculture, and Coastal Treaty Tribes after measuring toxin levels in shellfish collected from each beach (WA link; OR link), and not from the information presented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



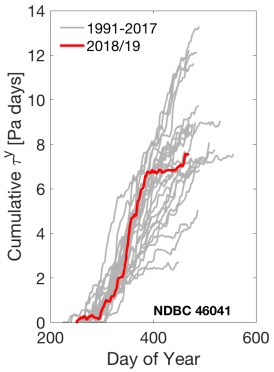
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

North-south Wind Stress

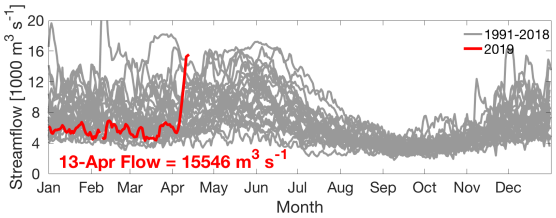


Southward wind stress drives coastal upwelling that can lead to plankton blooms. Northward wind stress tends to push any existing offshore plankton and toxins towards beaches. In addition, summer/fall toxic blooms often occur in years with a moderate cummulative upwelling index (i.e. during years with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

Cumulative Wind Stress



Columbia River Discharge



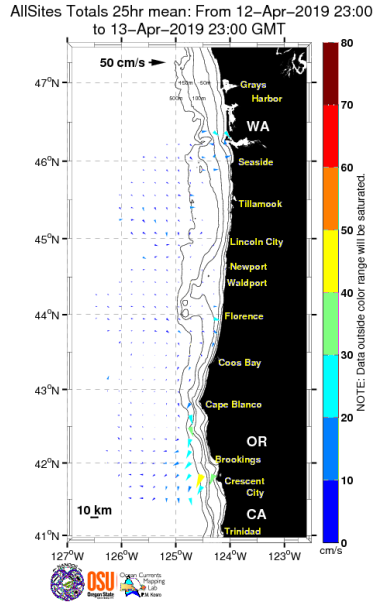
The Columbia River plume can help transport HABs and toxins from the south, northward along the WA coast. However, the plume can also serve as a protective barrier by preventing offshore toxins from reaching beaches.

Marine Weather Forecast

Mon - SE wind, 10 kt
Tue - SW wind, 10 kt
Wed - S wind, 10 kt
Thur - W wind, 10 kt

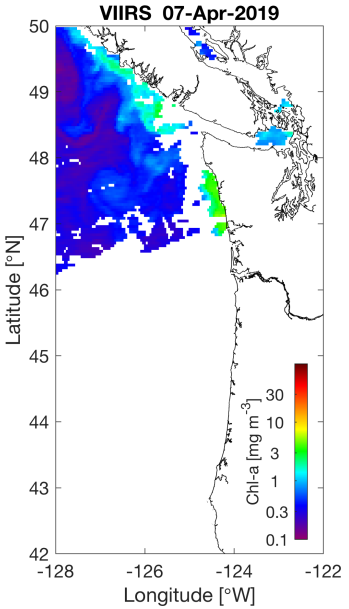
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

Ocean Surface Currents



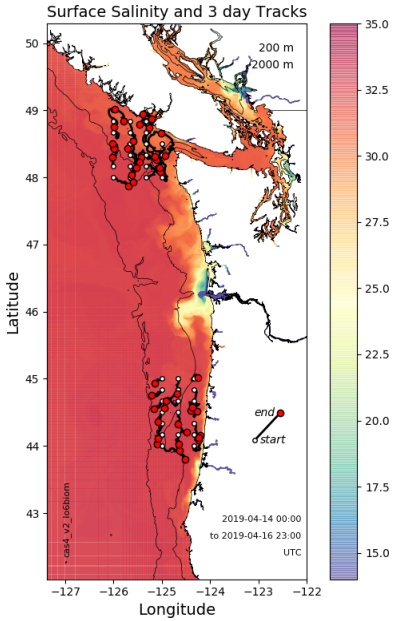
Primary currents flow north and south in winter and summer, respectively, except within ~10 km of shore, where fluctuations follow changes in wind direction.

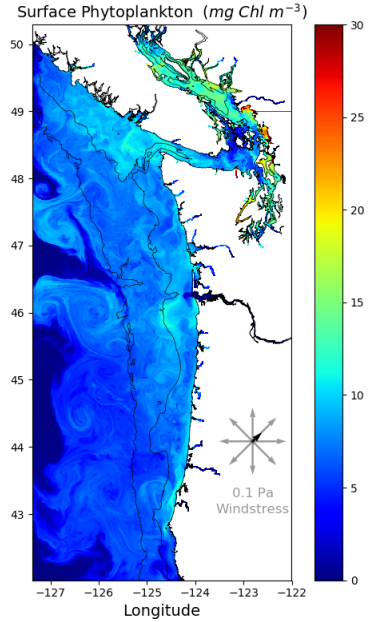
Satellite Chlorophyll-*a*



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 and phytoplankton with particles released near the Juan de Fuca eddy and Heceta Bank and tracked 3 days into the future.

Summary - Aside from a couple of short upwelling-favorable events, winds were predominantly northward along the coast over the last week. Clear images from satellites have been sparse; available cloud-free portions suggest that chlorophyll-*a* remains relatively low near the coast. Large morphology *Pseudo-nitzschia* (*PN*) cells remain at moderate concentrations along most of the WA coast (Long Beach: 33,000 cells/L on 11-Apr; Copalis: 36,000 cells/L on 4-Apr; Neah Bay: 62,000 cells/L on 8-Apr). Large *PN* cells have decreased at northern OR beaches with highest abundances at Seaside (15,000 cells/L) on 9-Apr. Small cells sporadically appeared in modest abundance at northern WA sites on 8-Apr (Kalaloch: 28,000 cells/L, Neah Bay: 42,000 cells/L). Particulate domoic acid (pDA) levels have remained low at southern WA sites and have been undetectable at central and northern WA sites since 2-Apr. Samples collected 31-Mar offshore of Newport, OR, contained low abundances of large and small *PN* cells near shore; pDA was detectable at all stations in low quantities (<21 ng/L). No *PN* species information is currently available. Razor clam DA samples from WA were ≤7 ppm as of 2-Apr. As of 12-Apr, Clatsop Beach razor clams had decreased to 11 ppm DA. OR beaches south of Cape Blanco remain closed to shellfish harvest.

Forecast - Mild El Niño conditions are ongoing and expected to persist throughout summer. The PDO index remains positive. Weak, but predominantly northward winds are likely to continue through Wednesday, leading to continued relatively stagnant ocean flows, as indicated by the LiveOcean forecast. By Friday, southward winds are expected to build and it appears that they may remain in place through at least next Sunday. Thus, we anticipate a few days of upwelling-favorable conditions before any potential interruptions by fronts with northward wind reversals. Such conditions will likely result in increased *PN* cell abundances throughout the region. Given the generally weak winds and relatively warm and sluggish ocean state over the last couple of months, and the fact that toxins remain measureable at some sites, the potential for a toxic spring bloom remains elevated. Since current shellfish DA levels and pDA levels are relatively low, for now we recommend continued short-term caution. Managers should remain particularly wary of any wind relaxations or northward wind reversals following the anticipated period of upwelling later this week.