Pacific Northwest Harmful Algal Blooms Bulletin

Apr 16, 2023 HAB risk = 

HAB risk key:

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

School of Oceanography, University of Washington

Cooperative Institute for CLIMATE, OCEAN & ECOSYSTEM STUDIES

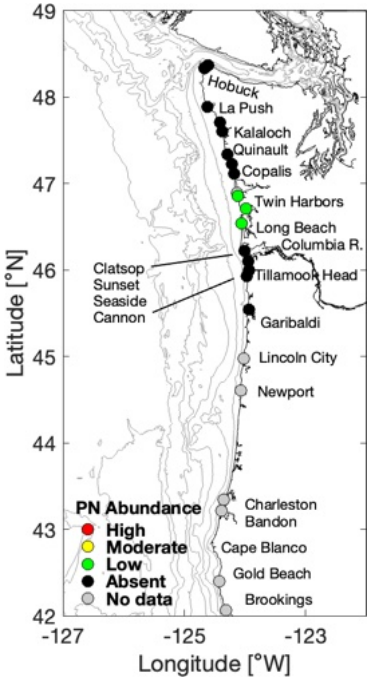
ORHAB PARTNERSHIP

NANOOS

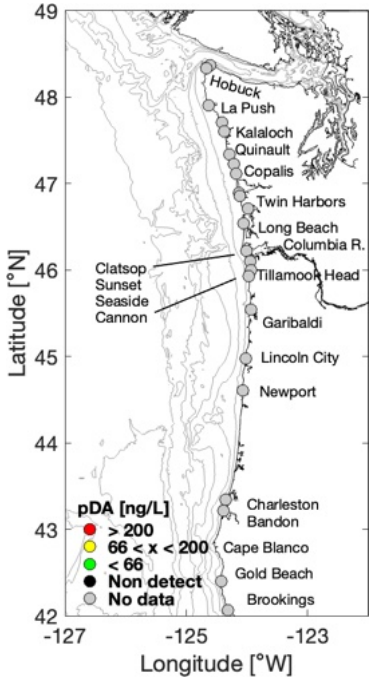
The statements, findings, conclusions, and recommendations do not necessarily reflect the views of NOAA or the Department of Commerce.

Beach Sampling

(*Pseudo-nitzschia*)

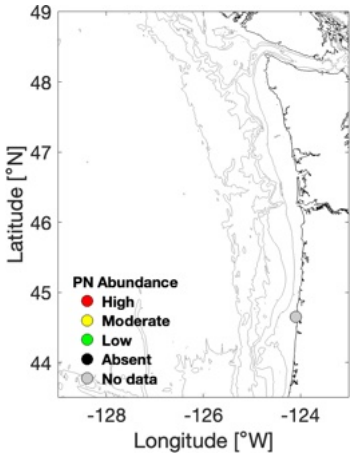


(particulate domoic acid)

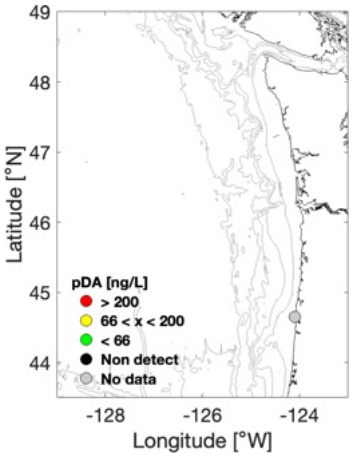


Offshore Sampling

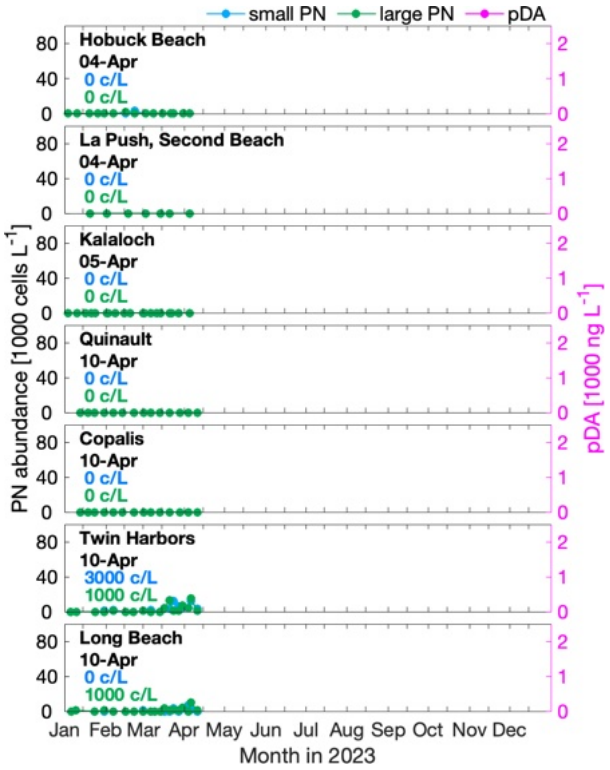
(*Pseudo-nitzschia*)



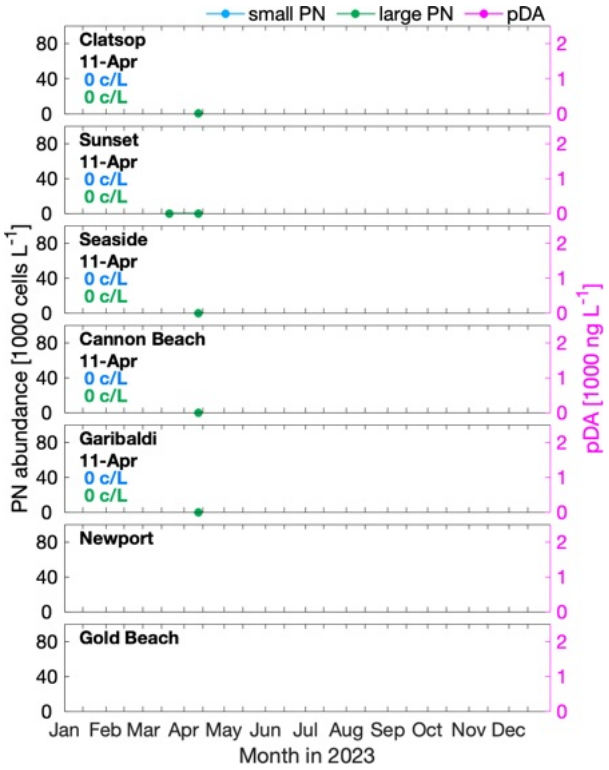
(particulate domoic acid)



WA *Pseudo-nitzschia* & Domoic Acid



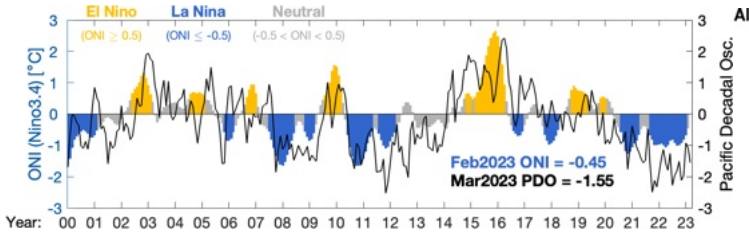
OR *Pseudo-nitzschia* & Domoic Acid



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.

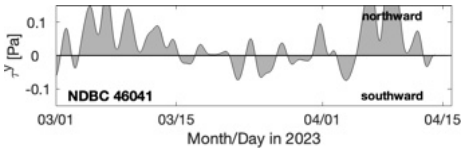
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health, the Oregon Department of Agriculture, and Coastal Treaty Tribes after measuring toxin levels in shellfish collected from each beach (WA link; OR link), and not from the information presented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



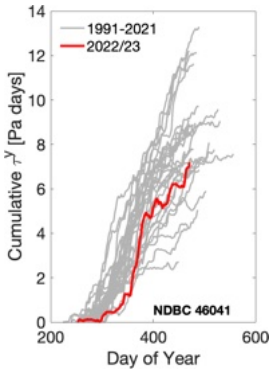
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

North-south Wind Stress

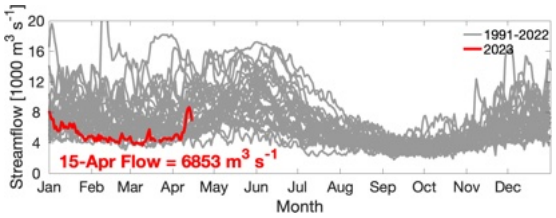


Southward wind stress drives coastal upwelling that can lead to plankton blooms. Northward wind stress tends to push any existing offshore plankton and toxins towards beaches. In addition, summer/fall toxic blooms often occur in years with a moderate cummulative upwelling index (i.e. during years with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

Cumulative Wind Stress

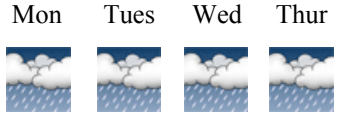


Columbia River Discharge



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.

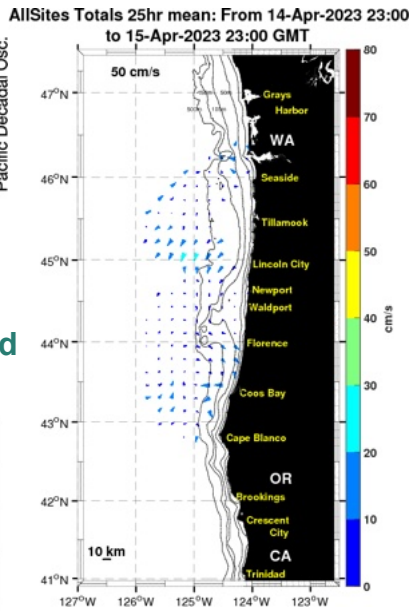
Marine Weather Forecast



Mon - S wind, 25 kt
Tues - SW wind, 20 kt
Wed - SW wind, 10 kt
Thur - SW wind, 10 kt

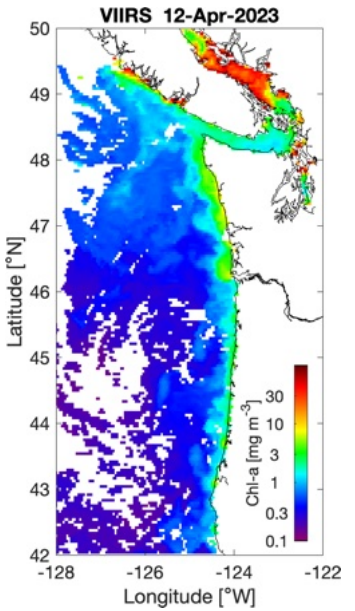
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

Ocean Surface Currents



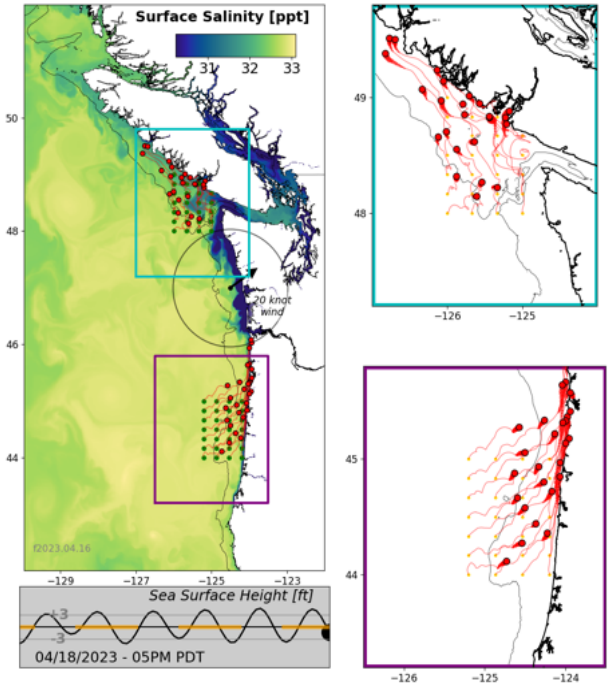
Primary currents flow north and south in winter and summer, respectively, except within ~10 km of shore, where fluctuations follow changes in wind direction.

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. Red dots indicate particle end points.

Summary - Stronger upwelling-favorable winds have been blowing off CA. Off WA and OR, a short-lived upwelling-favorable period occurred at the start of April, but storms, with downwelling-favorable winds, have been much more common over the last two weeks. Outflow from the Columbia River has finally begun to increase; the flow is currently nearly double what it was just two weeks ago. According to the LiveOcean model, that low-salinity plume water inhabits the entire Washington coast. Satellite images continue to indicate only moderate chlorophyll-*a* concentrations along the coast, and that signal is likely associated with the turbid fresh water runoff. *Pseudo-nitzschia* (*PN*) cell concentrations have started to slowly increase at southern WA beaches. The highest recent values were observed at Twin Harbors on 5-Apr (15,000 cells/L large morphology *PN*; 12,000 cells/L small morphology *PN*). No *Pseudo-nitzschia* cells were detected this week at northern OR beaches. Given the low *PN* concentrations, seawater particulate domoic acid (pDA) has not yet been quantified. Razor clam DA concentrations continue to generally decrease, with some fluctuations, depending on the beach. Razor clam samples collected at WA beaches were all below the 20 ppm DA closure limit, with highest values (12–13 ppm) at Twin Harbors and Willapa Spits as of 11-Apr. Razor clams still remain over the closure limit at OR beaches, but values are continuing to drop there. Samples from Sunset Beach were at 25 ppm on 11-Apr.

Forecast - The equatorial Pacific Ocean is currently in an ENSO neutral state. This is expected to transition to El Niño at some point this summer. The PDO remains negative, but should decrease in magnitude in the coming weeks. Another storm follows those that arrived this weekend and will impact the coast on Monday with strong northward winds. A weaker disturbance will arrive Tuesday. Winds will weaken Wednesday and could turn upwelling-favorable on Thursday. Uncertainty is high in the longer-term forecast, but at present, another storm is due to arrive next Saturday, effectively continuing current conditions instead of transitioning to a stable upwelling state. We do generally expect *PN* concentrations to begin increasing soon. However, even if stable upwelling were to arrive late next week, there are no current or historical indications that present conditions would be conducive to a large toxic *PN* event. Risk of a toxic *PN* event appears to be relatively low.