Pacific Northwest Harmful Algal Blooms Bulletin

Nov 1, 2022 HAB risk = ✖

HAB risk key:
- ✔ = *low*
- ⚠ = *medium*
- ✖ = *high*

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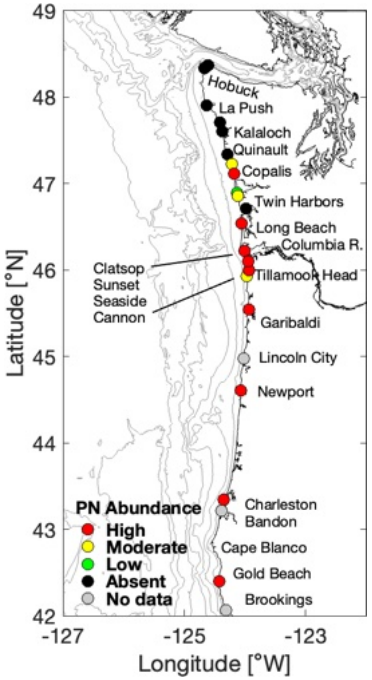
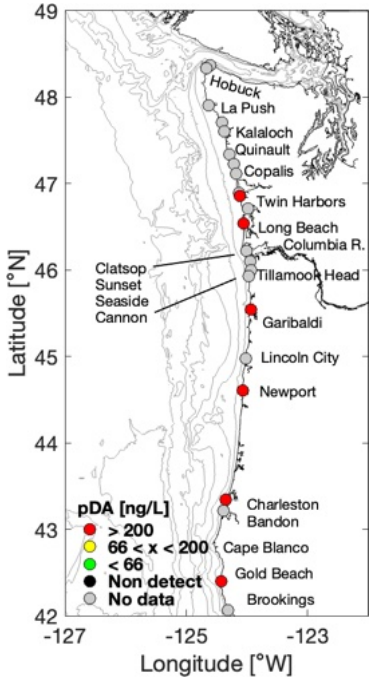
Cooperative Institute for CLIMATE, OCEAN & ECOSYSTEM STUDIES
ORHAB PARTNERSHIP
NANOOS

Beach Sampling

(*Pseudo-nitzschia*)

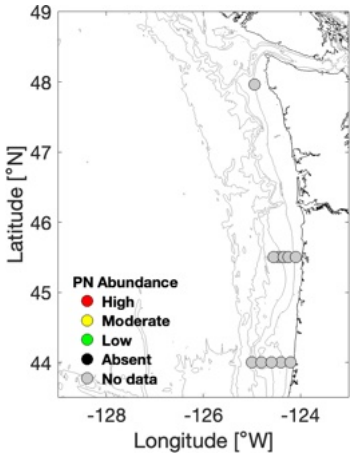


(particulate domoic acid)

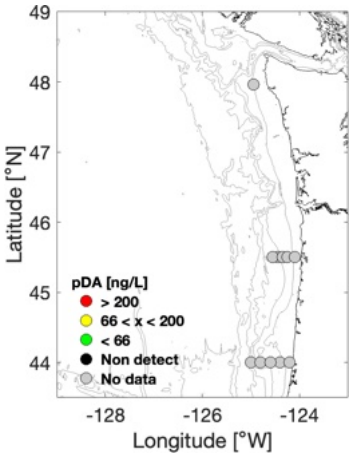


Offshore Sampling

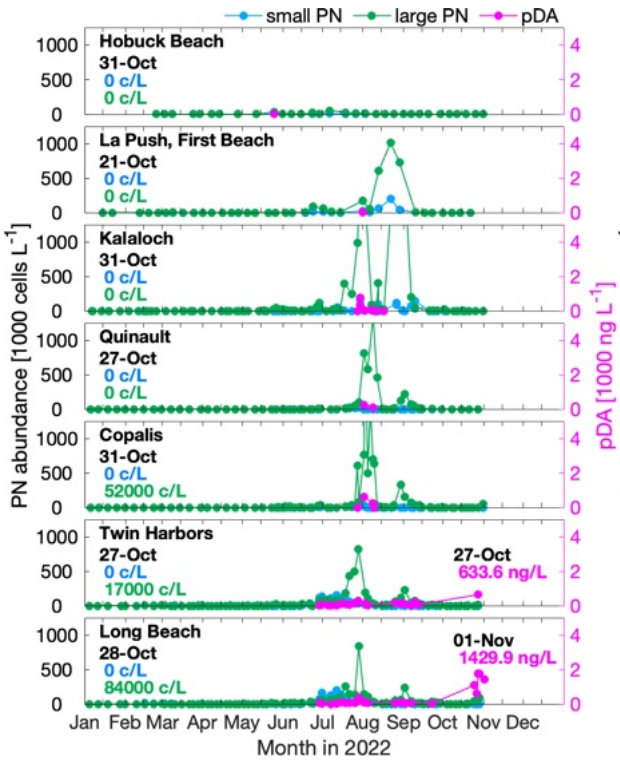
(*Pseudo-nitzschia*)



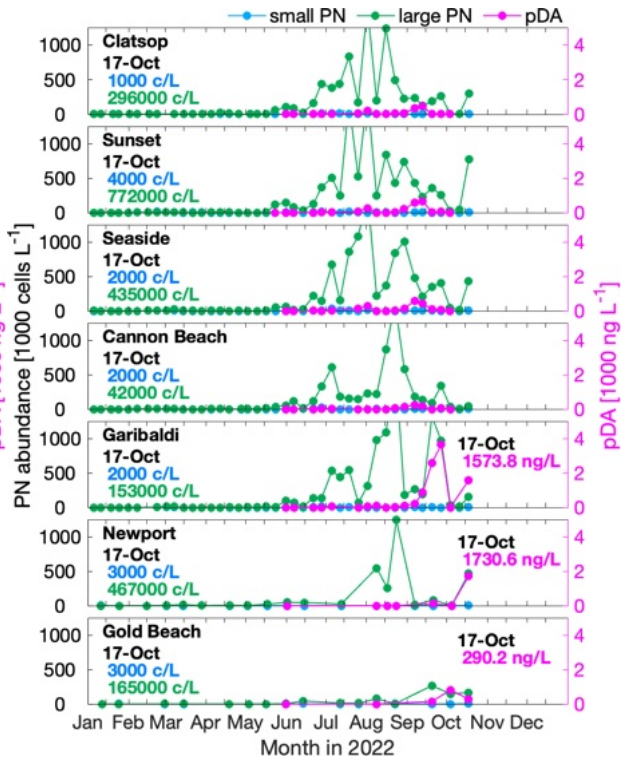
(particulate domoic acid)



WA *Pseudo-nitzschia* & Domoic Acid



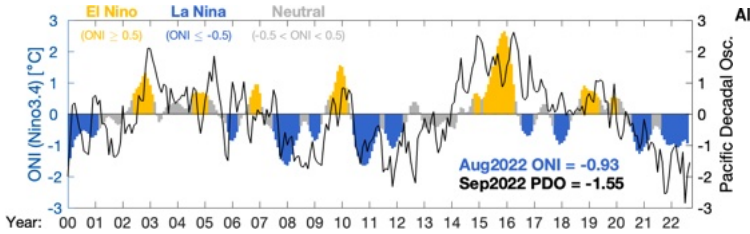
OR *Pseudo-nitzschia* & Domoic Acid



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.

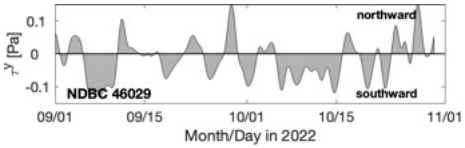
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health, the Oregon Department of Agriculture, and Coastal Treaty Tribes after measuring toxin levels in shellfish collected from each beach (WA link; OR link), and not from the information presented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



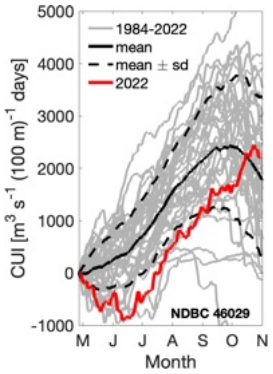
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

North-south Wind Stress

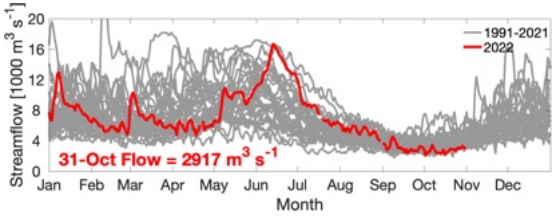


Southward wind stress drives coastal upwelling that can lead to plankton blooms. Northward wind stress tends to push any existing offshore plankton and toxins towards beaches. In addition, summer/fall toxic blooms often occur in years with a moderate cummulative upwelling index (i.e. during years with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

Cumulative Wind Stress

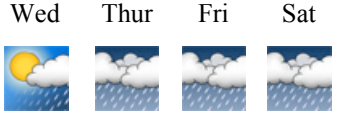


Columbia River Discharge



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.

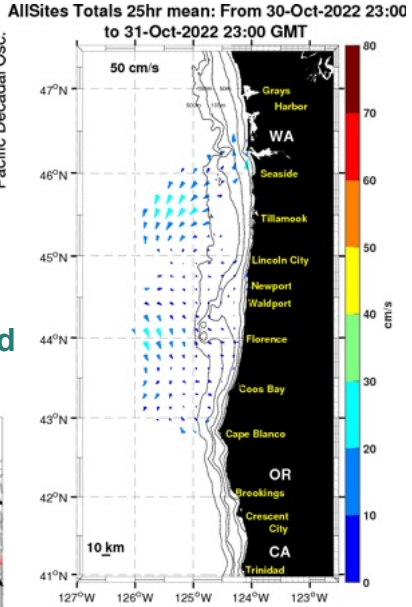
Marine Weather Forecast



Wed - Light wind, 5 kt
Thur - S wind, 20 kt
Fri - SW wind, 20 kt
Sat - SW wind, 15 kt

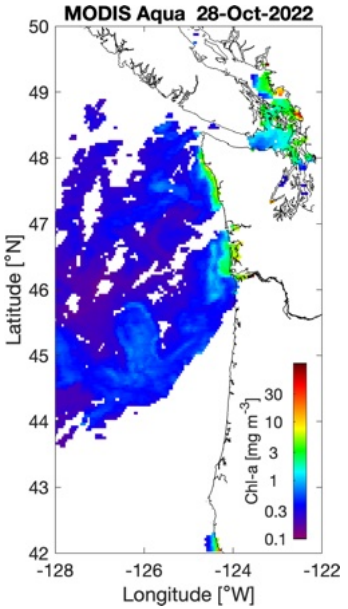
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

Ocean Surface Currents



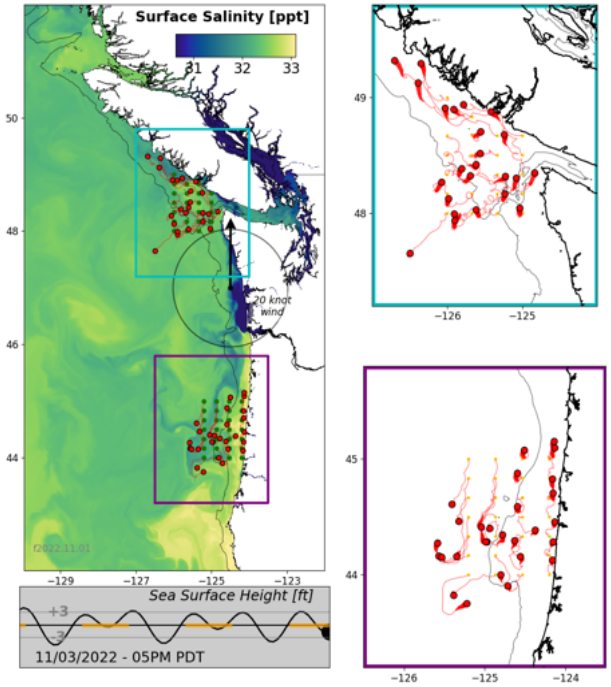
Primary currents flow north and south in winter and summer, respectively, except within ~10 km of shore, where fluctuations follow changes in wind direction.

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. Red dots indicate particle end points.

Summary - The end of summer was capped by relatively persistent upwelling-favorable winds in the first half of October. Conditions have since changed to a more typical fall/winter configuration with a series of stronger storms set to impact the region. Clear satellite images have been sparse, but the available data suggest narrow bands of chlorophyll-*a* remain adjacent to shore along both WA and OR. *Pseudo-nitzschia* (*PN*) concentrations rebounded at OR beaches in mid October, as expected based on offshore samples collected during a NOAA Ecosystem cruise in late September. Large-celled *PN* concentrations as high as 772,000 cells/L at Sunset Beach, OR, and particulate domoic acid (pDA) as high as 1730 ng/L at Newport, OR, were recorded on 17-Oct. With the onset of stronger northward winds last week, large morphology *PN* cells and pDA also began to appear at southern WA beaches, likely transported north from OR. At Long Beach, WA, *PN* cell concentrations were 84,000 cells/L on 28-Oct, and pDA was as high as 1775 ng/L on 27-Oct. A 31-Oct sample from Copalis had 52,000 cells/L large *PN*. Despite at least three consecutive days with elevated seawater pDA concentrations, razor clams collected at Long Beach on 27-Oct contained only 7 ppm DA; razor clams from Twin Harbors and Copalis contained 10 ppm DA, and mussels collected from Westport had detectable concentrations of DA on that same date. Razor clam DA concentrations were as high as 22 ppm at Quinault as of 21-Oct. In OR, razor clam DA was as high as 110 ppm at both Coos Bay and Newport, and was 23 ppm at Clatsop as of 28-Oct.

Forecast - La Niña conditions are expected to continue through the winter months before transitioning to a neutral state in spring. The most recent PDO value is strongly negative. The current weather is expected to continue for the foreseeable future, with a number of storms impacting the region. Winds will fluctuate some as storms pass, but will generally be directed onshore and northward. The predominantly northward winds have already pushed toxic *PN* from OR into WA, and we believe that such risk will continue in the near-term. *P. australis*-like cells were documented as far north as Copalis/Mocrocks on 31-Oct. Toxic cells may eventually be dispersed during the storms, but the time scale for that is unknown. Managers should remain diligent through this transitional period by carefully monitoring beach samples for both *PN* cells and pDA.