# Pacific Northwest Harmful Algal Blooms Bulletin

***May 16, 2023  HAB risk =***

*HAB risk key:*

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

School of Oceanography, University of Washington

Cooperative Institute for CLIMATE, OCEAN & ECOSYSTEM STUDIES

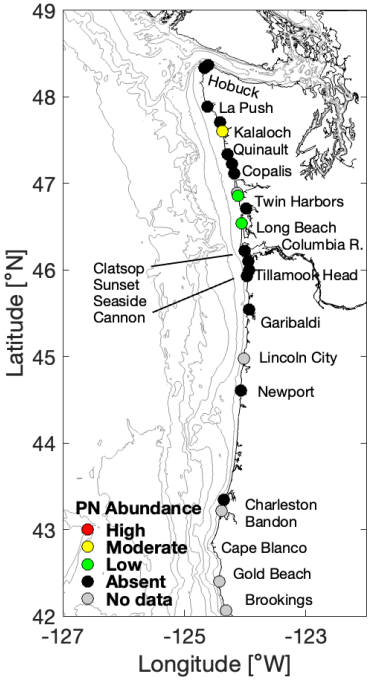
ORHAB PARTNERSHIP

NANOOS

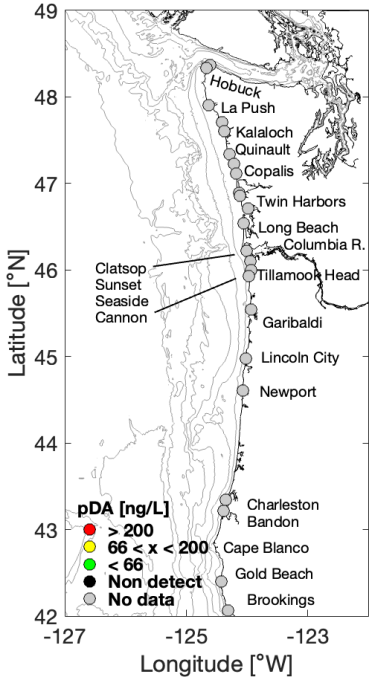
The statements, findings, conclusions, and recommendations do not necessarily reflect the views of NOAA or the Department of Commerce.

## Beach Sampling

(*Pseudo-nitzschia*)

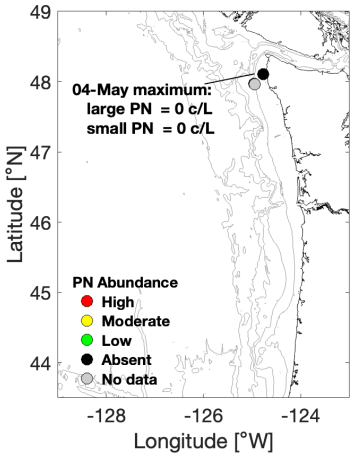



(particulate domoic acid)

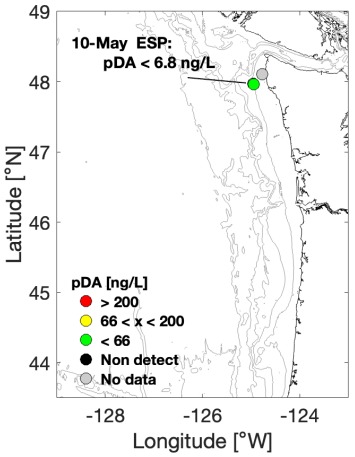



## Offshore Sampling

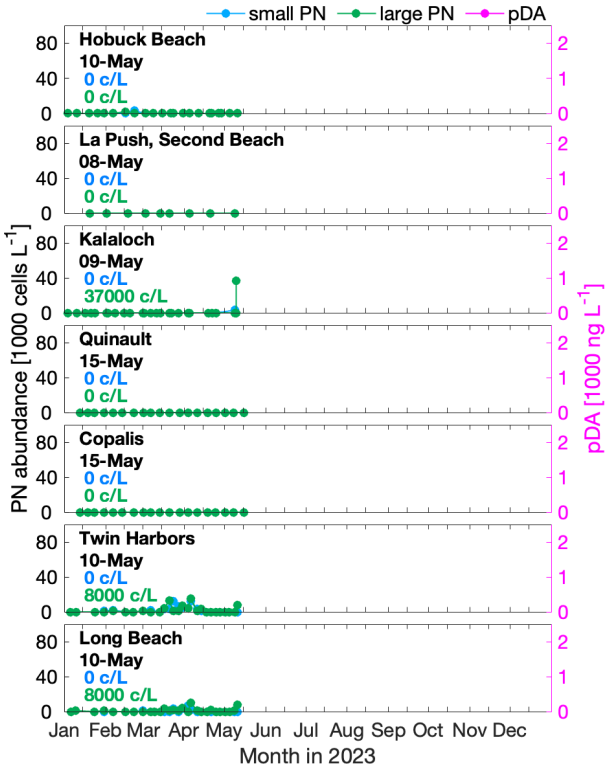
(*Pseudo-nitzschia*)



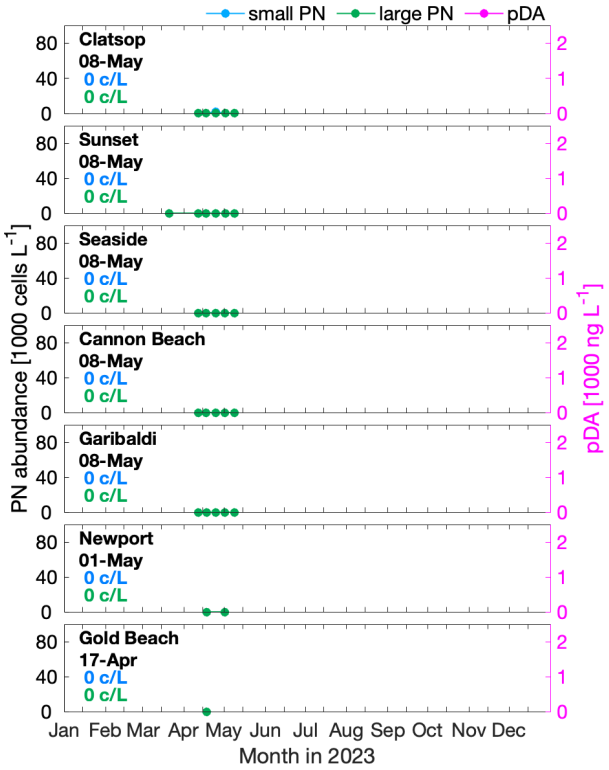

(particulate domoic acid)




## WA *Pseudo-nitzschia* & Domoic Acid



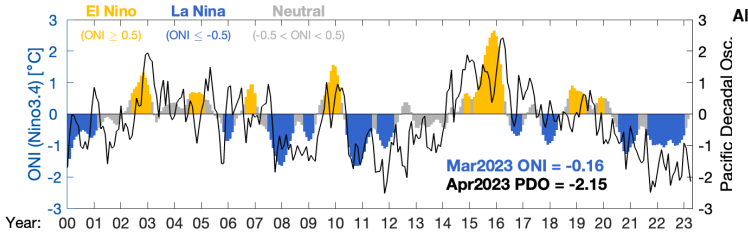

## OR *Pseudo-nitzschia* & Domoic Acid




*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.

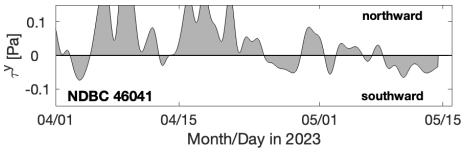
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health, the Oregon Department of Agriculture, and Coastal Treaty Tribes after measuring toxin levels in shellfish collected from each beach (WA link; OR link), and not from the information presented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



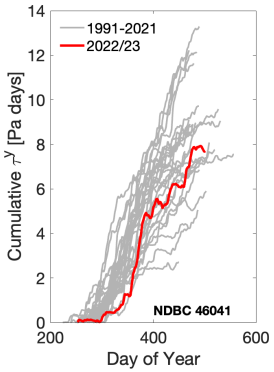

Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

## North-south Wind Stress

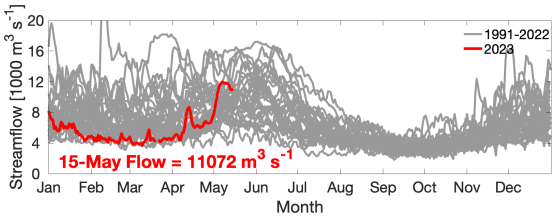



Southward wind stress drives coastal upwelling that can lead to plankton blooms. Northward wind stress tends to push any existing offshore plankton and toxins towards beaches. In addition, summer/fall toxic blooms often occur in years with a moderate cummulative upwelling index (i.e. during years with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

## Cumulative Wind Stress

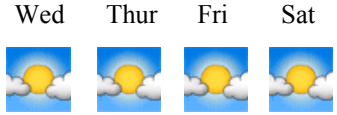



## Columbia River Discharge




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.

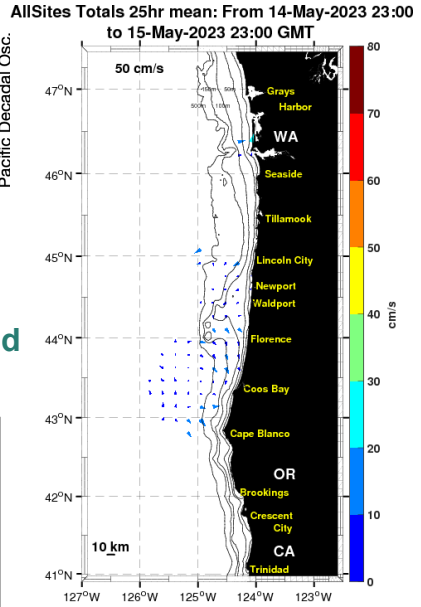
## Marine Weather Forecast




Wed - NW wind, 10 kt
Thur - SW wind, 5 kt
Fri - NW wind, 10 kt
Sat - NW wind, 10 kt

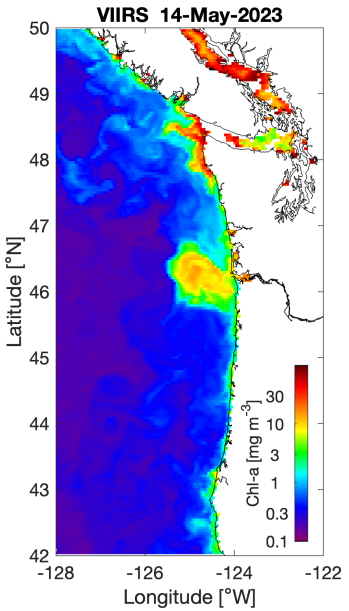
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

## 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.

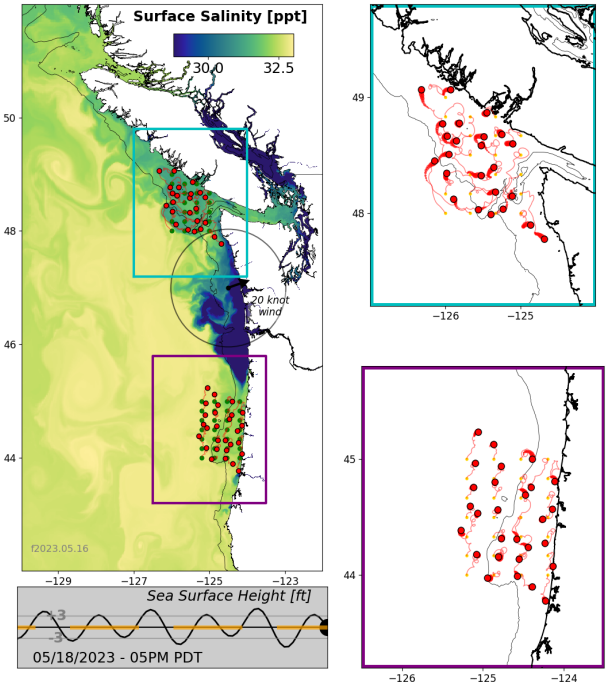
## Satellite Chlorophyll-*a*




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*** - Over the last couple of weeks a relatively sustained period of upwelling-favorable winds ultimately reverted to fluctuating winds. As a result, along-shelf transport currently appears weak and strong upwelling of deep water has not been established. Outflow from the Columbia River has increased substantially. According to the LiveOcean model, most of the Columbia River water is now concentrated in southern WA and northern OR, rather than residing exclusively along the WA coast. Clear satellite images have been more frequent, and show that the highest chlorophyll-*a* concentrations are now located off northern WA; elevated signals also appear near the Columbia River mouth, and south of Cape Blanco, OR. *Pseudo-nitzschia* (*PN*) cell concentrations remain low or nonexistent at most beaches, but samples collected from Long Beach and Twin Harbors, WA, late last week (10-May) both contained 8,000 cells/L of large morphology *PN* with some *P. australis*-like cells present. A sample collected from Kalaloch, WA, on 9-May contained 37,000 cells/L of large *PN*. Samples collected offshore of northern WA, on 4-May contained no *PN* cells, but the ESP mooring did detect particulate DA on 10-May (though at an unquantifiably low concentration). Razor clam DA concentrations continue to decrease. In WA, highest recent values (12 ppm) were at Twin Harbors on 26-Apr. In OR, Clatsop area razor clams had dropped to 15 ppm as of 12-May. Most beaches farther south in OR remain well over the regulatory DA closure limit.

***Forecast*** - An ENSO neutral state continues and is expected to transition to El Niño at some point this summer. The PDO remains negative. Short-term weather forecasts suggest that winds this week will continue to fluctuate north-south with an onshore component. This should lead to ocean conditions similar to those we are currently experiencing. Longer-term forecasts indicate that by late Friday, winds will turn southward (upwelling-favorable) and strengthen, and should remain so for an extended period, though uncertainty increases beyond next Monday. Given the current conditions and the longer-term upwelling-favorable forecast, near-term risk appears relatively low. However, *PN* cells have started to appear at beaches, and DA has been detected offshore of northern WA. If samples this week present no additional warnings, managers should be mindful of wind relaxations or northward reversals that could occur after the upwelling period this coming weekend.