Pacific Northwest Harmful Algal Blooms Bulletin

June 7, 2021 HAB risk =

HAB risk key:
- = *low*
- = *medium*
- = *high*

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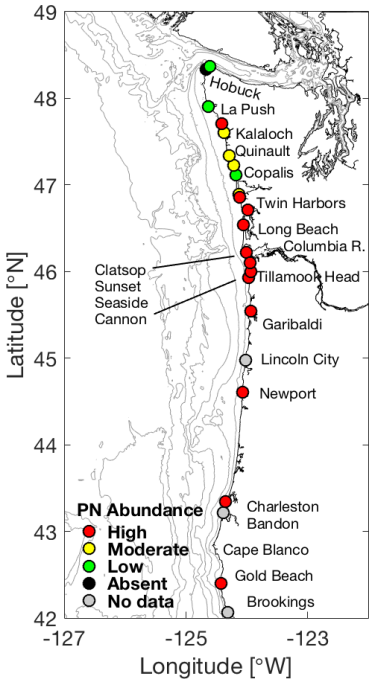
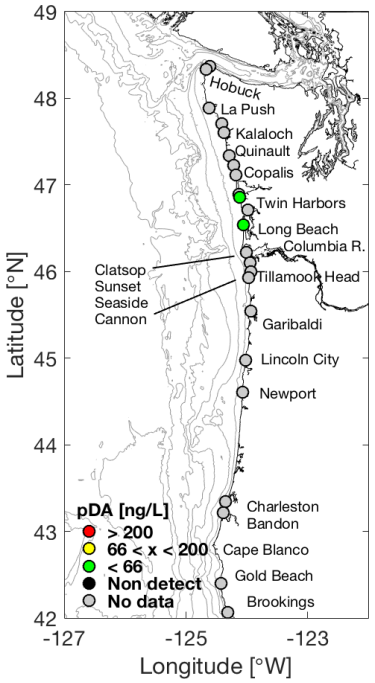
Cooperative Institute for CLIMATE, OCEAN & ECOSYSTEM STUDIES
ORHAB PARTNERSHIP
NANOOS

Beach Sampling

(*Pseudo-nitzschia*)

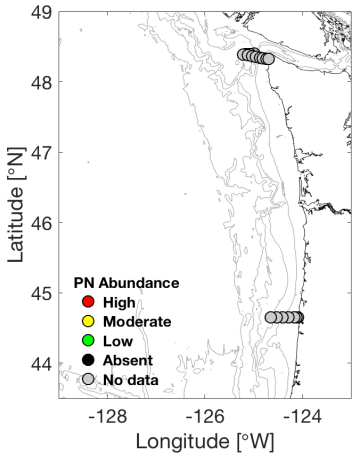


(particulate domoic acid)

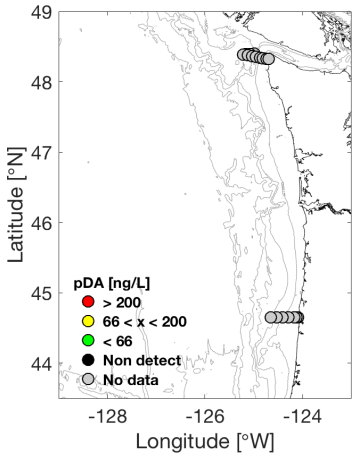


Offshore Sampling

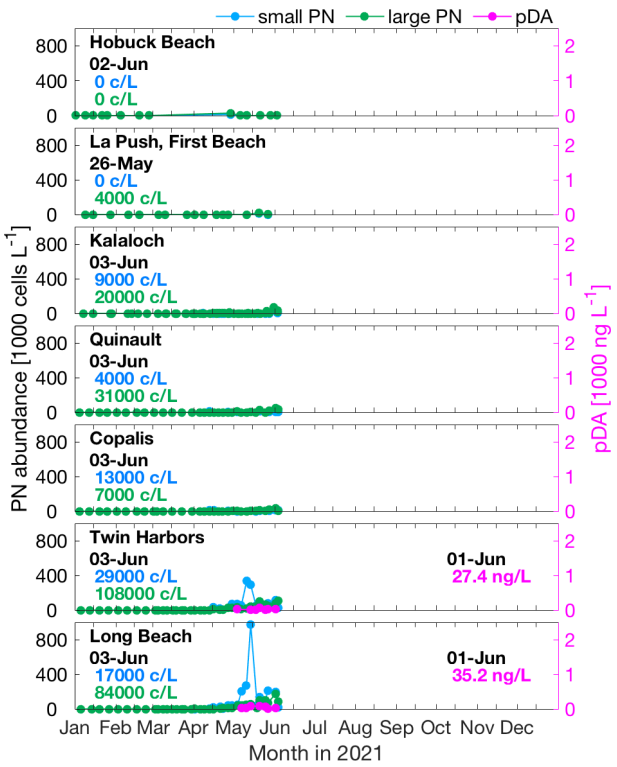
(*Pseudo-nitzschia*)



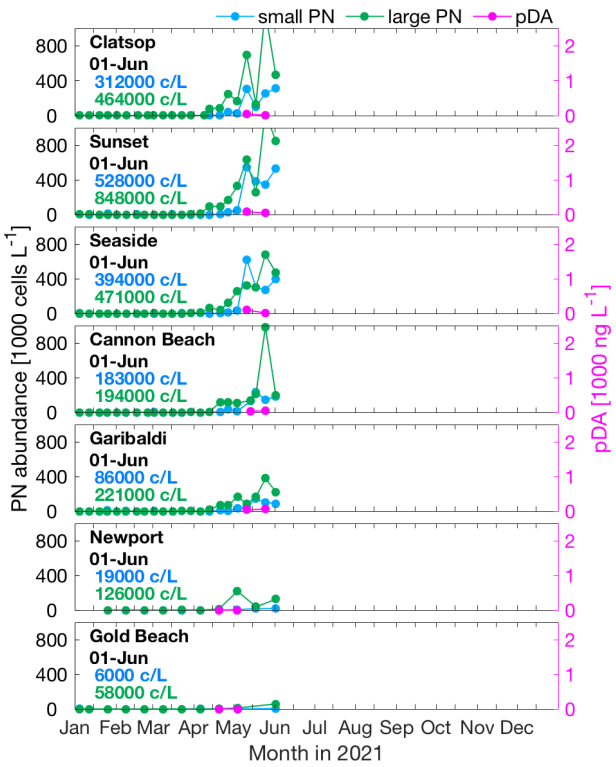
(particulate domoic acid)



WA *Pseudo-nitzschia* & Domoic Acid



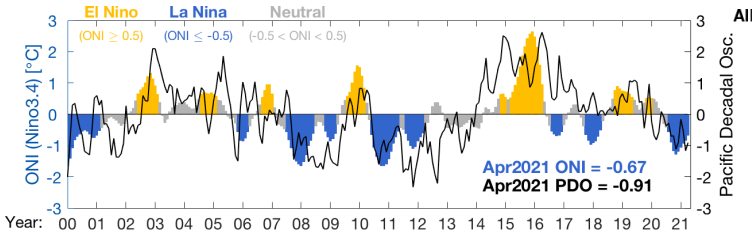
OR *Pseudo-nitzschia* & Domoic Acid



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.

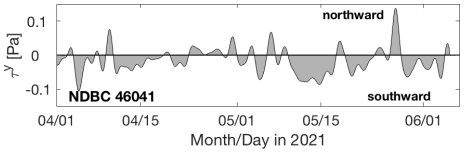
Decisions regarding shellfish harvest closures at individual beaches are made by the Washington Department of Health, the Oregon Department of Agriculture, and Coastal Treaty Tribes after measuring toxin levels in shellfish collected from each beach (WA link; OR link), and not from the information presented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



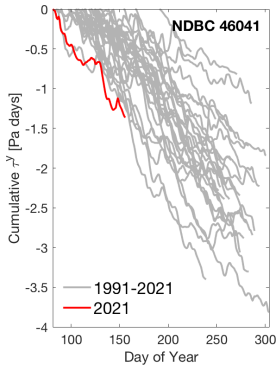
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

North-south Wind Stress

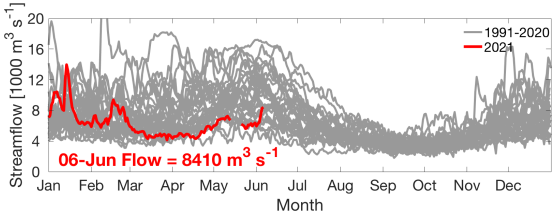


Southward wind stress drives coastal upwelling that can lead to plankton blooms. Northward wind stress tends to push any existing offshore plankton and toxins towards beaches. In addition, summer/fall toxic blooms often occur in years with a moderate cummulative upwelling index (i.e. during years with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

Cumulative Wind Stress



Columbia River Discharge



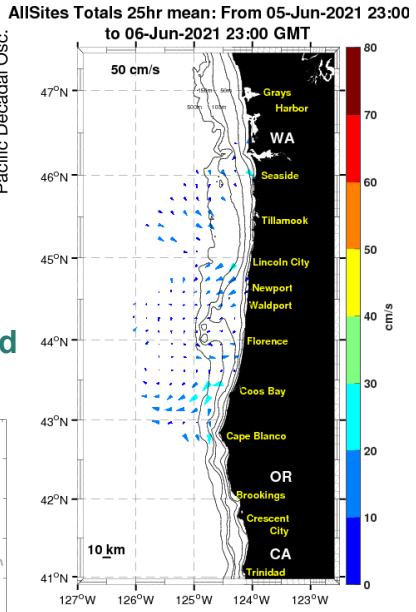
The Columbia River plume can help transport HABs and toxins from the south, northward along the WA coast. However, the plume can also serve as a protective barrier by preventing offshore toxins from reaching beaches.

Marine Weather Forecast

Wed - W wind, 10 kt
Thur - S wind, 15 kt
Fri - S wind, 20 kt
Sat - S wind, 10 kt

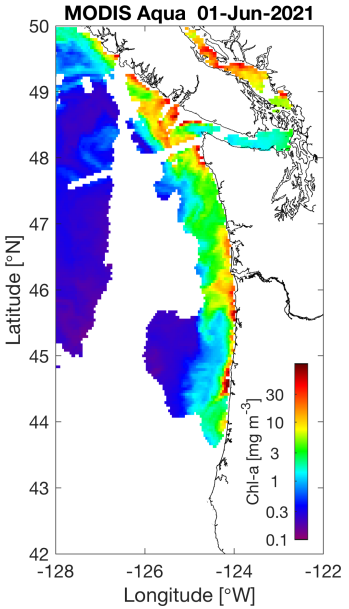
Fair weather can support plankton blooms whereas storms can concentrate any plankton and toxins on beaches.

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.

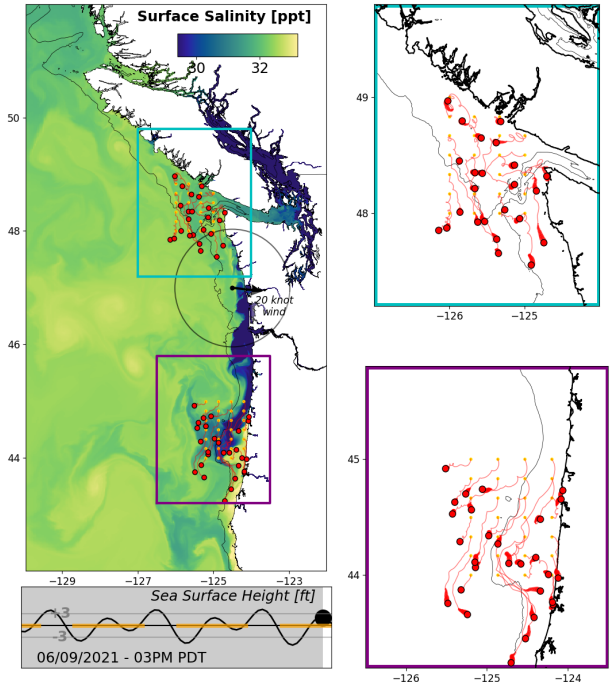
Satellite Chlorophyll-*a*



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 - Coastal winds have fluctuated over the last two weeks. Recent satellite images continue to show elevated chlorophyll-*a* throughout the region with highest values off northern WA, near the Columbia River, and near central OR. *Pseudo-nitzschia* (*PN*) cells also remain in high abundance at many sites, with highest values in northern OR (e.g., Sunset Beach on 1-Jun: 848,000 cells/L large *PN*; 528,000 cells/L small *PN*). Beach monitoring indicates that *PN* are a mix of large and small morphology cells at most sites, with cells in the large size class slightly outnumbering small cells. Large celled *PN* have started increasing at southern OR sites. In WA, highest *PN* abundances are at southern beaches (e.g., Long Beach on 1-Jun: 177,000 cells/L large *PN*; 197,000 cells/L small *PN*). *PN* cells have also started increasing at central WA beaches, with abundances of large morphology *PN* over the action limit as far north as Ruby Beach near Kalaloch (93,000 cells/L on 2-Jun). Seawater particulate domoic acid (pDA) has remained relatively low at southern WA beaches (<40 ng/L as of 1-Jun), despite the high *PN* abundances. In OR, recent analysis indicates potentially unrelaible pDA results from new ELISA kits. No recent offshore samples have been analyzed and the *PN* species composition is unknown. Razor clam DA concentrations at WA beaches continue to slowly decrease. As of 2-Jun, razor clam DA was ≤14 ppm at Copalis, Mocrocks, and Quinault Beaches. Razor clam samples collected from OR beaches on 28-May, also indicate decreasing DA concentrations. The highest OR value was found at Sunset Beach (17 ppm), but notably had fallen below the regulatory limit.

Forecast - Neutral ENSO conditions are expected to persist through summer. The PDO index remains negative. The short-term weather forecast suggests more of the same; that is, onshore and southward, but fluctuating winds are likely to continue through the early part of the week. Stronger northward winds are forecast for Thursday, and the longer-term forecast suggests they may remain northward through the weekend. These events will force plankton and any toxins toward shore. Since seawater pDA has been low in southern WA, the risk of a large DA event in central WA appears relatively low this week. Nevertheless, since toxins are present, but at unknown concentrations both offshore and in OR, and because the phytoplankton community can transition rapidly, we recommend diligent sampling with pDA analyses to ensure that upcoming harvests are safe.